SERIES D—No.7

HEALTH STATISTICS

FROM THE U.S. NATIONAL HEALTH SURVEY

evaluation of a single-visit Cardiovascular Examination

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

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for catalog card.

ERRATUM

Public Health Service Publication No. 584-D7

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This study is concerned with the design

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Abraham Ribicoff, Secretary

PUBLIC HEALTH SERVICE
Luther L. Terry, Surgeon General

Washington, D. C. December 1961

NATIONAL CENTER FOR HEALTH STATISTICS

Forrest E. Linder, Ph.D., Director
Theodore D. Woolsey, Assistant Director
O. K. Sagen, Ph.D., Assistant Director

U. S. NATIONAL HEALTH SURVEY

Theodore D. Woolsey, Chief
Alice M. Waterhouse, M.D., Chief Medical Advisor
James E. Kelly, D.D.S., Dental Advisor
Walt R. Simmons, Statistical Advisor
Arthur J. Mc Dowell, Chief, Health Examination Survey
Philip S. Lawrence, Sc.D., Chief, Health Interview Survey
Margery R. Cunningham, Staff Assistant
Robert T. Little, Chief, Automatic Data Processing

The U. S. National Health Survey is a continuing program under which the Public Health Service makes studies to determine the extent of illness and disability in the population of the United States and to gather related information. It is authorized by Public Law 652, 84th Congress.

CO-OPERATION OF THE CARDIOVASCULAR DEPARTMENT, MEDICAL RESEARCH INSTITUTE, MICHAEL REESE HOSPITAL

Under the legislation establishing the National Health Survey, the Public Health Service is authorized to use, insofar as possible, the services or facilities of other Federal, State, or private agencies. The methodological study described in this report was performed under a contractual arrangement with the Michael Reese Hospital.

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PREFACE

The uniform, single-visit examination frequently used for population studies differs both in objectives and procedures from the usual clinical examination. In clinical practice the objectives are evaluation and management of the individual patient. Usually the patient is under study for some complaint for which he has sought medical advice. If the diagnosis or treatment seems obvious on clinical grounds, the workup may be minimal. On the other hand, if the diagnostic clues are equivocal there may be an extended series of tests and consultations, and the patient may be under observation for appreciable periods before a diagnosis is established. Diagnosis may be modified by the patient's response to treatment or by his subsequent clinical history. There is, in short, a variable diagnostic workup and an extended opportunity to confirm or rule out the original impressions.

Clearly, this procedure is not well suited for survey studies. The National Health Survey in planning for the Health Examination Survey[1] required a single-visit examination which would yield cardiovascular findings and diagnoses in a standardized fashion on each and every examinee. These needs prompted the National Health Survey to contract with the Michael Reese Hospital to develop and evaluate such an examination. Identical needs existed in connection with plans for prospective studies in Chicago on the epidemiology of cardiovascular-renal diseases.[2-7]

The undertaking proved to be a complicated one, requiring the cooperation of many individuals in addition to the project staff itself. It is a pleasure to acknowledge the encouragement and support given by the late Herman N. Bundesen, M.D., President, Chicago Board of Health, by Samuel L. Andelman, M.D., M.P.H., Commissioner of Health, City of Chicago, and by Louis N. Katz, M.D., Director, Cardiovascular Department, Medical Research Institute, Michael Reese Hospital. Grateful acknowledgment is extended for the excellent contribution made by Messrs. Frank Bauer, Marvin Templeton, Carl Kolometz, Mrs. Juanita Ryan and Miss Donna Nolan of the Division of Vital Statistics and Information Services, Chicago Board of Health. It is also a pleasure to express deep appreciation for the vital contribution made by the executive boards, directors, staff, patients and particularly to Drs. A. J. Miller and T. A. Texidor, medical directors, the Gold Cross Organization; late Dr. Stanley E. Telser, medical director, the Chicago Health Center of the International Ladies Garment Workers Union and Dr. Herbert K. Abrams, medical director, Union Health Service. We are also grateful to Mrs. Bernice Block, Mrs. Mildred Colwell, Miss Wilda Miller, Mrs. Barbara Smith Pearson and Mrs. Adele Stamler for technical assistance.

For the special studies which are carried out at its expense but are not directly conducted by the National Health Survey, staff members are assigned for liaison with the research organization doing the study. In addition to participating in the design of this study, Drs. Alice Waterhouse and Oswald K. Sagen kept closely informed on the study progress and conveyed the viewpoint of the National Health Survey on questions of methodology. Mr. Tavia Gordon edited the final research report for publication in Health Statistics, Series D.

References listed on page 18.

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PROJECT STAFF

J. Stamler, M. D.	Director, Chronic Disease Control Division and Heart Disease Control Program, Chicago Board of Health; when the project began, Assistant Director, Cardiovascular Department, Medical Research Institute, Michael Reese Hospital. (Project Director).
Q. D. Young, M. D.	Adjunct, Chest Department, Michael Reese Hospital; Internist, Union Health Service; Research Physician, Heart Disease Control Program, Chicago Board of Health (Reviewing Physician, Clinical Examination).
D. M. Berkson, M. D.	Adjunct Physician, Department of Medicine, Michael Reese Hospital; Assistant Director, Heart Disease Control Program, Chicago Board of Health; Instructor, Department of Medicine, Northwestern University Medical School (Reviewing Physician, Special Examination).
Y. F. Hall, M. S.	Research Assistant, Heart Disease Control Program, Chicago Board of Health.
M. Lichtman, M. D.	Previously Resident, Department of Medicine, Michael Reese Hospital (Examining Physician, Special Examination).
A. Shaffer, M. D.	Physician in Charge of Catheterization Unit, Cardiovascular Department, Medical Research Institute, Michael Reese Hospital (Electrocardiographer, Special Examination).
H. Lasky, M. D.	Radiologist, Union Health Service (Roentgenologist, Special Examination).
D. Wallace, Ph. D.	Assistant Professor, Department of Statistics, University of Chicago (Statistical Consultant).
C. Estrada, M. D.	Previously Fellow, Cardiovascular Department, Medical Research Institute, Michael Reese Hospital (Examining Physician, Special Examination).
A. Creticos, M. D.	Previously Internist, Union Health Service (Examining Physician, Special Examination).

EVALUATION OF A SINGLE-VISIT CARDIOVASCULAR EXAMINATION

The research study, the results of which are presented here, was carried out by the Cardiovascular Department, Medical Research Institute, Michael Reese Hospital, under a contract with the U.S. National Health Survey, with the cooperation of the Heart Disease Control Program, Chicago Board of Health. J. Stamler, M.D., directed the project, initially in the Cardiovascular Department, Medical Research Institute, Michael Reese Hospital, later as Director, Heart Disease Control Program, Chicago Board of Health.* Dr. Stamler prepared the report which follows.

This study is concerned with the diagnosis and evaluation of a single-visit examination suitable for use in cardiovascular surveys. It was undertaken with the following objectives in mind:

1. To develop an examination procedure which would be carried out on a single visit and which would yield cardiovascular diagnoses in accord with the definitions of the New York Heart Association with certain modifications.[8-10]
2. To compare the cardiovascular diagnoses obtained by this examination with those obtained on the same individuals by clinical practice. In the subsequent discussion these two examinations will be referred to as the "Special" and the "Clinical" Examination, respectively.
3. To compare the cardiovascular diagnoses obtained by two independent Special Examinations of the same individuals.

THE SPECIAL EXAMINATION

The first undertaking was the development of a standardized cardiovascular examination—the "Special Examination." This involved the construction of a set of standard medical forms (Appendix I), a uniform examination procedure, a well-defined set of diagnostic criteria (Appendix II), and a routine for establishing diagnoses. For this purpose a pretest series of 66 examinations was done, in co-operation with the Union Health Service.

In its final form the examination took approximately one hour. It included a standardized medical history, physical examination, 12-lead electrocardiogram, 14 X 17 posteroanterior teleroentgenogram of the chest, urine sample, and venous blood specimen.

The medical history form (MS 001-12/57) was completed by a trained interviewer who was not a physician. Then the examinee was ushered into the physician's office, and asked to undress to the waist. The patient was seated and the blood pressure taken first in the right and then in the left arm with the cuff remaining on the left arm.

The physician then reviewed the medical history form, asking any questions he deemed pertinent. He questioned all patients specifically regarding chest pain, dyspnea, and claudication, recording his judgment on the medical history form. He also inquired concerning any history of antipressor therapy.

The examinee was then seated on the examining table and the blood pressure in the left arm was again recorded. After the head, eyes, fundi, neck, and chest were examined, the examinee was asked to lie down and the cardiac examination was performed. At the physician's discretion, the cardiac examination was repeated in the sitting position or after exercise. The peripheral vessels and extremities were next examined. Following this the blood pressure in the left arm in the sitting

*The epidemiological research of the Heart Disease Control program, Chicago Board of Health, is made possible by grant support from the Chicago Heart Association, the American Heart Association and the National Heart Institute, National Institutes of Health, U. S. Public Health Service.

position was once more recorded, and then the examinee was dismissed. The physician completed the physical examination form (MS 002), reviewed the history, and arrived at an initial diagnostic impression which was entered on the physical examination form.

Subsequently the electrocardiogram was read by an electrocardiographer and the chest X-ray was read by a roentgenologist. The electrocardiogram was read first without reference to the examination findings and then reviewed with access to a brief summary of the findings, which gave the blood pressure and initial diagnostic impression (Form MS 008-12/57). The latter interpretation was the one used for diagnosis. The X-ray was evaluated once only, with this form available to the roentgenologist. The content of the X-ray and electrocardiographic determinations may be judged from the standard forms G004-10/57 and G008-11/57.

The ECG, X-ray, and laboratory determinations were made available to the examining physician, who then completed his evaluation of the case. His definitive diagnostic conclusions were summarized on a special diagnostic summary sheet (MS 003-12/57). As anticipated, the ECG and X-ray data significantly influenced the diagnosis; in 20 percent of the cases a change was made from the initial diagnostic impression to the final diagnosis. The complete chart was then evaluated by a reviewing physician, who filled out a diagnostic summary sheet without reference to the conclusions of the examining physician. Any uncertainties, questions, or disagreements noted by the reviewing physician were referred back to the examining physician. Final diagnostic decisions were arrived at by the reviewing and examining physicians in joint consultations, with the reviewing physician acting as the final authority. There was one reviewing physician for all the Special Examinations.

Essential to the Special Examination was a standard set of diagnostic categories and criteria. Basically, the criteria were those of the New York Heart Association, with modifications suggested by recent conferences on methods for epidemiologic research.[8-10] Experience in the course of the Special Examination uncovered unanticipated difficulties and suggested additional changes in the diagnostic rules. Since the completion of this study, two valuable reports have appeared on diagnostic criteria for field surveys and epidemiological studies on cardiovascular diseases.[11,12]

The following cardiac diagnoses, positive or suspect, singly or in combination, were made in the course of the Special Examination: coronary heart disease (CHD) including myocardial infarction, angina pectoris, congestive heart failure of probable coronary etiology; hypertensive heart disease (HHD); rheumatic heart disease (RHD); congenital heart disease; aortic stenosis and aortic insufficiency; mitral insufficiency; cor pulmonale; chronic myocarditis; definite organic heart disease of suspect coronary etiology; organic heart disease of indeterminate etiology. For purposes of tabulation, cardiac diagnoses other than CHD, HHD, and RHD were classified under the broad heading, other heart disease. The other cardiovascular diagnoses made were: essential hypertension, cerebrovascular disease, and peripheral vascular disease. Criteria for these are presented in Appendix II. Some of the difficulties in formulating and applying the diagnostic rules are discussed in a later section on "Special Diagnostic Problems."

COMPARISON WITH THE CLINICAL EXAMINATION

An essential concern of this study was to determine the correspondence between the diagnostic results of the Special and Clinical Examinations. For that purpose three different medical groups were asked to participate in an evaluation of the Special Examination. These groups were: the Gold Cross Organization, the Chicago Health Center of the International Ladies Garment Workers Union, and the Union Health Service. These organizations furnished 100, 119, and 77 patients, respectively. The purpose and plan of the study was explained to the patients at the onset. No problem was encountered in terms of ability or willingness to participate. The age-sex-race composition of the examinees is shown in table 1.

The patients were chosen from among those who had just received or were due to receive a full medical examination at one of the co-operating institutions. A deliberate effort was made to include more than the usual number of persons with cardiovascular diseases. The prevalence of cardiovascular diseases and conditions in the study group is therefore atypical, either for clinical practice or for general population studies. (This affects the interpretation of the study results in a number of ways—some obvious, some not. These effects will be discussed in the section on "General Comments and Discussion.")

The Clinical Examination at these institutions included a routine cardiovascular examination,

Table 1. Number of examinees by race, age, and sex

Race and age	Both sexes	Male	Female
All races---	296	186	110
White			
All ages----	243	166	77
Under 35----------	17	15	2
35-44----------	46	38	8
45-54----------	59	38	21
55-64----------	82	47	35
65+----------	39	28	11
Negro			
All ages----	53	20	33
Under 35----------	9	4	5
35-44----------	12	7	5
45-54----------	21	6	15
55-64----------	10	2	8
65+----------	1	1	-

with a chest X-ray and a 12-lead electrocardiogram. Beyond that, it was unrestricted in its scope, including the time period over which the data were collected and the diagnostic procedures and recall visits utilized. For the purpose of this study, the physician doing the Clinical Examination summarized his findings on a diagnostic summary form identical with that used in the Special Examination. The entire chart, including the diagnostic summary form, was then scrutinized by a reviewing physician. As in the Special Examination, questions and disagreements were referred back to the examining physician for clarification. When necessary, the examining and reviewing physician conferred, with the latter serving as the final authority. This procedure left to the physicians responsible for the Clinical Examinations a broad discretion in the choice of criteria for the diagnosis of heart disease and hypertension. There was one reviewing physician for all the Clinical Examinations.

Unlike the Special Examination, which was uniform in content and restricted to a single visit, the Clinical Examination was of varying content. This is most easily indicated by a brief description of the various medical organizations. The Gold Cross Plan provides a comprehensive annual medical examination, referring its participants to other physicians for care or additional consultation, if this seems appropriate. Its participants receive their normal medical care from other sources. Most of them entered this study with a background of four or five comprehensive annual medical examinations under the Gold Cross Plan. The Union Health Service provides comprehensive prepaid medical care to its participants, who apply for medical service as they feel it necessary. The Chicago Health Center provides comprehensive diagnostic services and limited therapeutic services to its participants, who apply for medical service as they feel it necessary. While these latter two medical groups encourage periodic examinations, these were more the exception than the rule. Many, if not most, persons present themselves to these centers for treatment of specific complaints, rather than for periodic checkups. In either case, they receive a full work-up, and it is this work-up, undertaken in the normal course of their medical care, that is reported as their Clinical Examination. In many instances, this was the first full medical examination they received at these centers.

The Special and Clinical Examinations were administered and interpreted in complete independence, even to the point of using different electrocardiograms and X-ray films. Upon completion of both examinations, the diagnostic findings on each patient were analyzed and compared by a team consisting of the two reviewing physicians and the project director. A summary sheet was filled out in each case involving a diagnostic disagreement; this included a description and analysis of the basis for disagreement. In addition, findings were coded and punched on IBM cards for mechanical tabulation and analysis. The time lapse between the two examinations is indicated in table 2.

Comparison of findings from the two examinations was made in two ways. First, the total counts of various diagnoses were compared. Second, the diagnoses in individual cases were compared, since the number of diagnoses in the two examinations could conceivably be similar, while the specific persons with these diagnoses could be different. Thus a thorough evaluation of consistency between the two examinations had to include both an over-all and a case-by-case comparison.

Cardiac findings and diagnoses—comparison of total counts.—The two examinations yielded similar counts with respect to the total number of cases diagnosed no heart disease and definite heart disease (fig. 1). The Clinical Examination produced substantially more diagnoses of coronary heart disease and slightly more of hypertensive heart disease than the Special Examination. About the same number of cases of rheumatic heart disease and other heart disease were diag-

Table 2. Time lapse between Clinical and Special Examinations

Time	Number	Percent
Total----------	296	100.0
Clinical Examination first		
Less than 1 month------	152	51.4
1-3 months----------	72	24.3
3-6 months----------	27	9.1
6-9 months----------	14	4.7
More than 9 months-----	3	1.0
Special Examination first		
Less than 1 month------	12	4.1
1-3 months----------	14	4.7
3-6 months----------	2	0.7

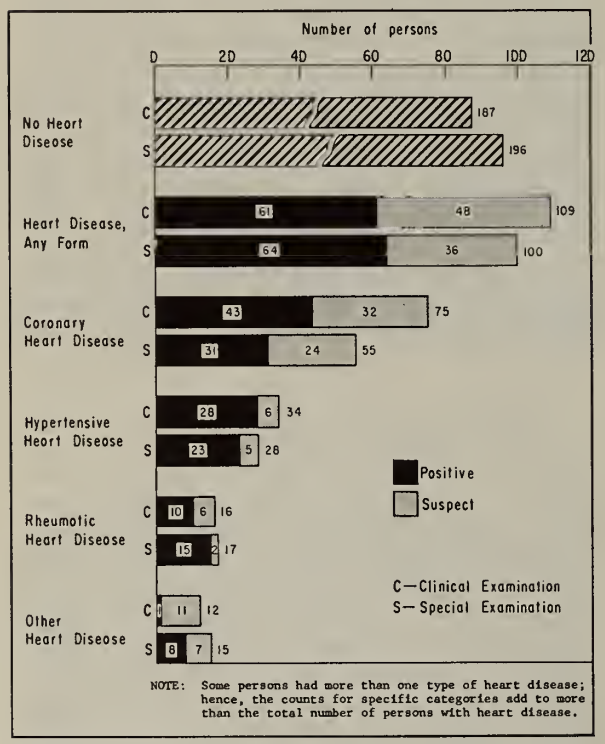

Figure 1. Number of persons with heart disease—Clinical and Special Examinations.

nosed by the two examinations, although the Special Examination led to a positive diagnosis more often, and a suspect diagnosis less often, than the Clinical Examination. Significant findings on the medical history and physical examination were more common on the Special than on the Clinical Examination, whereas the latter reported more electrocardiographic abnormalities (table 3). Findings of X-ray abnormalities were at about the same level on the two examinations.

Table 3. Number of persons with cardiac findings—Clinical and Special Examinations

Cardiac findings	Examination	
	Clinical	Special
History		
Angina pectoris------	20	25
Myocardial infarction	10	11
Cardiac dyspnea------	19	26
Physical examination		
Significant murmur---	37	51
Electrocardiogram		
Coronary heart disease----------	31	5
Left heart strain-left ventricular hypertrophy---------	28	29
Nonspecific abnormalities----------	42	19
X-ray		
Cardiomegaly---------	23	29
Chamber enlargement--	26	17
Aortic calcification-	35	33
Aortic elongation----	72	86

Cardiac diagnoses—comparison of individual cases.—The extent of agreement and disagreement in diagnosing organic heart disease (irrespective of specific type) is shown in table 4. Over-all agreements totaled 231 (78.0 percent), i.e., agreement on 170 negative, 16 suspect, and 45 positive cases. Of the 65 disagreements, 22 were positive on one diagnosis and suspect on the other, 30 were of the negative-suspect type. The other 13 disagreements were of the positive-negative type. These 13 were evenly distributed, i.e., in 7 the Clinical Examination was positive and the Special Examination, negative; in 6 vice

Table 4. Organic heart disease—comparison of diagnoses on the same person by Clinical and Special Examinations

Clinical Examination	Special Examination			
	Total	Positive	Suspect	Negative
Total-	296	64	36	196
Positive----	61	45	9	7
Suspect-----	48	13	16	19
Negative----	187	6	11	170

versa. These 13 positive-negative disagreements represent 4.4 percent of the 296 cases examined.

In 208 cases (70.3 percent), there was agreement either that no organic heart disease or that the same specific kind of organic heart disease was present; summary of categories of disagreement in the other 88 cases is shown in table 5.

Table 5. Comparison of heart disease diagnoses in Clinical and Special Examinations

Diagnostic comparison	Number	Percent
All agreements	208	70.3
Agreement—no heart disease	170	57.4
Agreement—definite heart disease, same specific diagnosis----------	28	9.5
Agreement—suspect heart disease, same specific diagnosis----------	10	3.4
All disagreements	88	29.7
Disagreement—both positive for organic heart disease, difference in specific diagnosis----------	17	5.7
Disagreement—both suspect for organic heart disease, difference in specific diagnosis----------	6	2.0
Disagreement—negative vs. suspect for heart disease-	30	10.1
Disagreement—suspect vs. positive for heart disease	22	7.4
Disagreement—negative vs. positive for heart disease	13	4.4

Coronary heart disease (CHD).—The pattern of agreement and disagreement for this diagnosis is presented in table 6. For 57 of the 296 persons

Table 6. Coronary heart disease—comparison of diagnoses on the same person by Clinical and Special Examinations

Clinical Examination	Special Examination			
	Total	Positive	Suspect	Negative
Total-	296	32	25	239
Positive----	42	21	6	15
Suspect-----	31	5	10	16
Negative----	223	6	9	208

under study there was a measurable disagreement with respect to the diagnosis of coronary heart disease. In 11 instances the disagreement was of the positive-suspect type, in 25 of the negative-suspect type. The latter were not evenly distributed, there being more suspect CHD in the Clinical than in the Special Examination. In the remaining 21 cases, there was a diagnosis of definite coronary heart disease on one examination and of no coronary heart disease on the other. Again there were more cases of definite CHD diagnosed by the Clinical than by the Special Examination. Many of these disagreements, diagnosed "no CHD" by one examination, were positive for organic heart disease of another type. In only 7 of these 21 cases did one examination make a positive diagnosis of CHD while the other found no organic heart disease whatsoever.

The sources of these disagreements may be classified according to the parts of the examination from which they arose, i.e., the medical history, physical examination, ECG, X-ray, and laboratory. In addition, an interval change in the examinee's health may conceivably be responsible for a diagnostic disagreement. It is not always possible to identify definitively the factors responsible for a specific disagreement. Despite this, it is essential to attempt such a specific analysis. Appendix III summarizes this analysis for all heart disease diagnoses, Appendix IV presents the specific evaluation for the 21 cases with a negative-positive disagreement on CHD. Of these 21 disagreements, 15 were positive for CHD on the Clinical Examination and negative on the Special, 6 the reverse. Angina pectoris (AP) clearly was responsible for a sizable number of disagreements (table 7). In 7 cases AP was diag-

Table 7. Angina pectoris—comparison of diagnoses on the same person by Clinical and Special Examinations

Clinical Examination	Special Examination			
	Total	Positive	Suspect	Negative
Total-	296	25	9	262
Positive----	20	13	1	6
Suspect-----	5	2	0	3
Negative----	271	10	8	253

NOTE: In some of the cases with a disagreement on the diagnosis of angina pectoris there was nevertheless agreement on a CHD diagnosis, based on other criteria.

nosed by the Clinical Examination, but not by the Special, accounting for the disagreement with respect to CHD; in 6 cases the reverse was true. Here, therefore, the disagreements balanced out. This problem of the diagnosis of angina pectoris is a key one for health surveys and epidemiological studies on CHD.

All but one of the other disagreements derived from the electrocardiogram. In these, the Clinical Examination diagnosed CHD based on the ECG, whereas the Special did not. Five of these involved ECG tracings read by the Special Examination as left heart strain (LHS), and interpreted as the basis for a diagnosis of hypertensive heart disease in the presence of concomitant blood pressure elevations. In contrast, the Clinical Examination either read these tracings as LHS and diagnosed CHD based on them, or read them as LHS with ischemic changes, again warranting a CHD diagnosis.

This tendency for the Clinical and Special Examinations to disagree diagnostically based on the ECG also was reflected in the 25 negative-suspect disagreements on CHD. As already noted, these were not evenly distributed, there being 16 cases in which the Clinical Examination diagnosed suspect CHD and the Special, no CHD, and 9 cases vice versa. Of the 16, the disagreements arose from the ECG in 10 cases, from the history with respect to AP in 2. In contrast, of the 9 cases negative on the Clinical and suspect on the Special for CHD, the disagreement was related to evaluation for angina in 6. Thus, the Special Examination generally diagnosed less CHD (definite and suspect) based on the ECG than did the Clinical, and more angina pectoris, particularly more suspect angina pectoris.

It is conceivable that the greater variety of tests available to the Clinical Examination than the Special might, in some instances, have led to a diagnosis of CHD which could not have been made on the Special Examination. No such instances were noted in this study. It is also conceivable that the limitation of the Special Examination to a single session might have led to missing some diagnoses of CHD that were picked up in a succession of visits in the Clinical Examination. Again, no such instances were noted in this study.

It is evident that differences in criteria or interval changes in health provided only a minor source of disagreement in the diagnosis of CHD. There were three instances where the diagnostic difference clearly arose from a difference in criteria. These all centered around the electrocardiogram. In one instance the Clinical Examination arrived at a positive diagnosis on the basis of a pattern indicating left ventricular hypertrophy; in another it arrived at a suspect diagnosis solely on the basis of a right bundle branch block; and in a third a first degree AV block provided the sole basis for a suspect diagnosis. In all three instances the same electrocardiographic findings were noted on the Special Examination but were not deemed to satisfy the criteria for CHD. In the first instance, the Special Examination diagnosed definite HHD; in the second, suspect organic heart disease, type indeterminate; in the third, no heart disease, despite the fact that its own criteria called for a suspect CHD diagnosis with first degree A-V block on the electrocardiogram. In two other cases changes in medical status occurred in the interval between the Special and Clinical Examination, leading to one definite and one suspect diagnosis on the Clinical Examination where the Special Examination had not diagnosed CHD.

It is not always clear, of course, whether a difference in diagnosis reflects different findings or different diagnostic criteria; e.g., where the ECG was read LHS (Special Examination) vs. LHS with ischemic changes (Clinical Examination). Again, interval changes in health are not always easy to recognize. Thus, we must allow the possibility of a few other unrecognized instances where the diagnostic disagreement might be properly attributable either to differences in diagnostic criteria or interval changes in health.

Hypertensive heart disease (HHD).—For 26 of the 296 persons under study there was a disagreement on the diagnosis of hypertensive heart disease (table 8). In 15 instances the diagnosis on one examination was positive for HHD while on the other examination it was negative. In another 7 instances one examination led to a suspect diagnosis of HHD while the other was negative. In 4 cases the disagreement was between a positive and a suspect diagnosis of HHD.

Table 8. Hypertensive heart disease—comparison of diagnoses on the same person by Clinical and Special Examinations

Clinical Examination	Special Examination			
	Total	Positive	Suspect	Negative
Total-	296	23	5	268
Positive----	28	16	3	9
Suspect-----	6	1	0	5
Negative----	262	6	2	254

There were two chief sources of disagreement in this series of cases. One was related to the finding of hypertension; the other, to the finding of electrocardiographic evidence of heart disease. The disagreements between Clinical and Special Examinations with respect to the finding of hypertension nearly balanced. In 6 cases, 5 definite and 1 suspect, HHD was diagnosed by the Clinical Examination, whereas the Special Examination did not find elevated blood pressure and therefore could not diagnose HHD. Similarly, 5 definite and 2 suspect cases of HHD were diagnosed on the Special Examination where a finding of hypertension was not made on the Clinical Examination.

When disagreements in diagnosing HHD arose with a finding of hypertension on both examinations, these were mainly traceable to the electrocardiogram. Again, as with disagreements in the diagnosis of CHD, disagreements in the diagnosis of HHD arising on the basis of the electrocardiogram resulted in more disease under the Clinical than under the Special Examination. In fact, there was no instance where a disagreement on a current electrocardiogram was the prime reason for a diagnosis of HHD, positive or suspect, by the Special Examination but not by the Clinical. On the other hand, there were 5 cases diagnosed definite HHD on the Clinical Examination where differences in the ECG readings accounted for a diagnosis of suspect HHD or no HHD by the Special Examination. In addition, there were other instances where differing ECG interpretations by the two examinations played a contributory role in disagreements on the diagnosis of HHD.

There were 3 cases where other findings accounted for a disagreement in the diagnosis of HHD. In 2 cases, the disagreement arose from differences in findings with respect to a murmur on auscultation. In the other instance, a history of cardiac dyspnea was elicited on the Clinical Examination but not on the Special.

Some disagreements suggest limitations of the Special Examination for the diagnosis of HHD. In 4 cases diagnosed HHD on the Special Examination the blood pressures taken on the single-visit Special Examination indicated the person to be hypertensive, while a succession of blood pressures at different times was available to the Clinical Examination and led to a conclusion that the person was not hypertensive. In another 3 cases earlier electrocardiograms available to the Clinical Examination differed from the current tracings available to the Special Examination. These provided evidence of heart damage and led to HHD diagnoses on the Clinical Examination that could not be made on the Special Examination.

Rheumatic heart disease (RHD).—The chief source of disagreement in the diagnosis of rheumatic heart disease was in the finding or interpretation of heart murmurs. In 9 of the 13 cases where there was a disagreement on this diagnosis (table 9), the finding on auscultation was apparently

Table 9. Rheumatic heart disease—comparison of diagnoses on the same person by Clinical and Special Examinations

Clinical Examination	Special Examination			
	Total	Positive	Suspect	Negative
Total-	296	15	2	279
Positive----	10	8	0	2
Suspect-----	6	2	1	3
Negative----	280	5	1	274

the main reason for the disagreement. Both the history and electrocardiogram were only minor sources of disagreement. Problems in interpretation also constituted a source of disagreement. There were 3 cases where essentially the same findings led to a diagnosis of positive RHD on one examination but not the other. In one instance, the alternative diagnosis was suspect RHD, in the second it was congenital heart disease, and in the third the diagnosis was aortic stenosis and insufficiency, etiology not specified.

Other heart disease.—The category, other heart disease, represented a group of diagnoses with various problems. In most instances, the diagnoses given (definite or suspect) were nonetiological, e.g., in a third of the cases the diagnosis was no more than heart disease, etiology indeterminate. In an equal number of cases the

anatomic type of heart damage (aortic stenosis, aortic or mitral insufficiency, chronic myocarditis) was noted but no etiology was suggested. The remaining cases were diagnosed either as cor pulmonale or congenital heart disease.

It is evident, therefore, that in this study the category, other heart disease, represented largely a repository of problems. This is further indicated by the fact that only 2 cases were so diagnosed by both the Special and the Clinical Examinations, whereas 21 cases were assigned to this category on one examination but not the other (table 10). A brief analysis of these disagreements, heterogeneous though they be, may be helpful.

Table 10. Other heart disease—comparison of diagnoses on the same person by Clinical and Special Examinations

Clinical Examination	Special Examination			
	Total	Positive	Suspect	Negative
Total-	296	7	7	282
Positive----	1	1	0	0
Suspect-----	10	0	1	9
Negative----	285	6	6	273

Of the 21 disagreements, there were 8 instances where one examination diagnosed no heart disease of any kind, while the other examination made a diagnosis of other heart disease. In all but 1 of these instances a difference in findings accounted for the disagreement. In 9 other cases the alternative to a diagnosis of other heart disease was a diagnosis of heart disease of coronary, rheumatic, or hypertensive etiology (4,3, and 2 cases, respectively). In 1 of these 9 cases the disagreement arose because of a change in cardiovascular status in the interval between the two examinations. In 4 other cases a difference in findings accounted for the difference in diagnosis. In the remaining 4 cases the findings on the two examinations were substantially the same. This problem of a different interpretation of substantially similar findings was also evident in the 4 remaining instances of disagreement. In these cases both examinations agreed that coronary heart disease was present, but an additional heart pathology, belonging in the category of other heart disease, was diagnosed on one examination but not the other. These problems are discussed briefly in the section on "Some Diagnostic Problems."

Table 11. Number of persons with other cardiovascular diagnoses and findings—Clinical and Special Examinations

Findings	Examination	
	Clinical	Special
Peripheral vascular disease----------	25	42
Cerebrovascular disease---	2	2
Hypertension----------	45	46
Hypertensive retinopathy--	17	66

In 5 cases, differences in the medical history were critical to the diagnostic disagreement on other heart disease. In 3 of these a history indicative of angina pectoris was noted on one examination but not the other, which based its diagnosis of other heart disease on less specific indications of heart disease. In one case a history of rheumatic fever obtained on one examination led to a diagnosis of rheumatic heart disease, while the other examination, failing to elicit this history, diagnosed suspect congenital heart disease. Finally, a history suggestive of chronic myocarditis was elicited on one examination but not the other, accounting, in large part, for a difference on this diagnosis.

Other cardiovascular diagnoses and findings.—The Special Examination diagnosed more cases of peripheral vascular disease than the Clinical (table 11). Both examinations diagnosed the same 2 cases of cerebrovascular disease.

The Special Examination described considerably more hypertensive retinopathy on funduscopy than the Clinical. Of the cases described by

Table 12. Hypertension—comparison of diagnoses on the same person by Clinical and Special Examinations

Clinical Examination	Special Examination			
	Total	Positive	Suspect	Negative
Total-	296	46	8	242
Positive----	45	26	4	15
Suspect-----	6	2	0	4
Negative----	245	18	4	223

the Special Examination as positive for hypertensive retinopathy, 34 (51.5 percent) were diagnosed as normotensive. These apparent inconsistencies and disagreements are commented on subsequently in the section on "Special Diagnostic Problems."

With respect to the diagnosis of hypertension, the two examinations agreed in diagnosing normotension in 223 cases and definite hypertension in 26 (table 12). In 33 cases, there was a negative-positive disagreement. The total number of cases diagnosed definite hypertension was essentially the same in the two examinations. The matter of blood pressure measurement and interpretation is discussed further in the later section on "Special Diagnostic Problems."

COMPARISON OF REPLICATE SPECIAL EXAMINATIONS

To compare the diagnoses on the same persons made by two Special Examinations, 80 of the 296 persons in the study received a second Special Examination. These 80 persons were chosen from participants in the study who were patients at the Chicago Health Center and the Union Health Service. Both Special Examinations used the same electrocardiographic, X-ray, and laboratory reports. Otherwise they were independent.

Cardiac findings and diagnoses—comparison of total counts.—The two Special Examinations yielded similar findings with respect to the total number of cases diagnosed heart disease, with the first diagnosing more definite and less suspect heart disease than the second (table 13). The comparative counts of the Clinical Examination in these 80 cases are also presented in table 13.

Cardiac diagnoses—comparison of individual cases.—This comparison is limited by the relatively small number of cases and the restricted nature of the replication of the two Special Examinations. The extent of agreement and disagreement between the two Special Examinations in diagnoses of organic heart disease (irrespective of specific type) is detailed in table 14. Diagnostic agreement occurred in 66 of the 80 cases (82.5 percent), a similar level of agreement to that obtaining between the Clinical and Special Examinations (table 15, cf. table 4). Only 1 of the 14 disagreements was of the negative-positive type (1.3 percent), whereas 3 (3.8 percent) negative-positive disagreements were recorded among these 80 cases in the Clinical-Special comparison. The comparative findings in the diagnosis of organic heart disease by the three examinations are presented in table 16. Diagnostic agreement among all three obtained in 58 of 80 cases (72.5 percent).

Table 14. Organic heart disease—comparison of diagnoses on the same person by two Special Examinations

Special Examination 1	Special Examination 2			
	Total	Positive	Suspect	Negative
Total--	80	14	14	52
Positive-----	20	14	5	1
Suspect------	11	0	6	5
Negative-----	49	0	3	46

Table 13. Number of persons with heart disease on replicate Special Examinations and corresponding Clinical Examinations

Type of heart disease	Positive			Suspect		
	Clinical	Special #1	Special #2	Clinical	Special #1	Special #2
Coronary----------	15	13	9	4	7	8
Hypertensive------	9	5	3	2	0	4
Rheumatic---------	3	3	3	1	1	1
Other-------------	0	2	0	2	4	1
Total[1] ----------	20	20	14	9	11	14

[1]Several people had more than one type of heart disease, but are counted here only once.

Table 15. Organic heart disease—comparison of diagnoses on the same person by replicate Special Examinations and corresponding Clinical Examination

Diagnosis		Number of persons	Diagnosis		Number of persons
Clinical	Special #1		Special #1	Special #2	
Diagnoses agree			Diagnosis agree		
Total		64	Total		66
Positive	Positive	15	Positive	Positive	14
Suspect	Suspect	3	Suspect	Suspect	6
Negative	Negative	46	Negative	Negative	46
Diagnoses disagree			Diagnoses disagree		
Total		16	Total		14
Positive	Suspect	3	Positive	Suspect	5
Suspect	Positive	4	Suspect	Positive	0
Suspect	Negative	1	Suspect	Negative	5
Negative	Suspect	5	Negative	Suspect	3
Positive	Negative	2	Positive	Negative	1
Negative	Positive	1	Negative	Positive	0

For coronary heart disease the Clinical and Special Examinations disagreed in 14 of these 80 cases, while the two Special Examinations disagreed in 10 (table 17). Of these 10 disagreements, 3 were of the negative-positive type. In part because the same electrocardiographic and X-ray reports were used, the chief basis for disagreement in this diagnosis between the two Special Examinations was the history of angina pectoris, which accounted for 7 of the 10 disagreements. In the 3 disagreements not based on differences in the history relating to angina pectoris, one examination yielded no diagnosis of this disease while the other yielded a suspect diagnosis. In one case the first examining physician felt the X-ray indicated borderline heart enlargement, while the other felt it was essentially normal. In another case, the difference arose from one examining physician preferring to interpret the electrocardiogram as indicating a possible old myocardial infarction, while the other physician felt it indicated left heart strain. It should be remembered that both physicians had the same X-ray and electrocardiogram and the same expert evaluations of these. The third disagreement in this group arose from the finding of a murmur on one examination not noted on the other.

Diagnostic comparison between the two Special Examinations with respect to hypertensive heart disease is presented in table 18. Among the 5 disagreements, 1 was of the negative-positive type. In 3 cases, one of the two examinations did not find hypertension and, ipso facto, could not diagnose hypertensive heart disease, whatever other findings were present. The two other disagreements in the diagnosis of hypertensive heart disease were, first, a difference between a suspect and a positive diagnosis, based on a different interpretation of the same evidence, and second, a difference between a negative and a suspect diagnosis, based on different evaluations of a borderline electrocardiogram. Similarly, one of the two disagreements (both of the suspect-negative type) in the diagnosis of rheumatic heart disease resulted from a different evaluation of essentially the same findings (table 19).

In 5 instances the first Special Examination diagnosed other heart disease (2 positive, 3 suspect), while the second did not (table 20). In all but 1 of these cases either suspect coronary, hypertensive, or rheumatic heart disease was diagnosed by the second Special Examination. These cases involved special diagnostic problems, which will be discussed below.

One point that stands out with especial clarity from an evaluation of the replicate Special Examinations is that diagnostic disagreements tended to concentrate in a small subgroup of cases. This is well exemplified by the data for coronary heart disease. The replicate Special Examinations dis-

Table 16. Organic heart disease—comparison of diagnoses on the same person by three examinations—Clinical and two Special Examinations

Diagnosis			Number of persons
Clinical	Special #1	Special #2	
1) All examinations in agreement			58
Positive	Positive	Positive	12
Suspect	Suspect	Suspect	2
Negative	Negative	Negative	44
2) Two examinations in agreement			20
a) With a suspect-positive or suspect-negative disagreement			
Positive	Positive	Suspect	3
Suspect	Suspect	Negative	1
Negative	Negative	Suspect	2
Suspect	Positive	Suspect	2
Negative	Suspect	Negative	3
Suspect	Positive	Positive	2
Negative	Suspect	Suspect	2
Positive	Suspect	Suspect	2
Suspect	Negative	Negative	1
b) With a positive-negative disagreement			
Negative	Positive	Negative	1
Positive	Negative	Negative	1
3) No examinations in agreement			2
Positive	Suspect	Negative	1
Positive	Negative	Suspect	1

Table 17. Coronary heart disease—comparison of diagnoses on the same person by two Special Examinations

Special Examination 1	Special Examination 2			
	Total	Positive	Suspect	Negative
Total--	80	9	8	63
Positive-----	13	9	1	3
Suspect------	7	0	4	3
Negative-----	60	0	3	57

Table 18. Hypertensive heart disease—comparison of diagnoses on the same person by two Special Examinations

Special Examination 1	Special Examination 2			
	Total	Positive	Suspect	Negative
Total--	80	3	4	73
Positive-----	5	3	1	1
Suspect------	0	0	0	0
Negative-----	75	0	3	72

Table 19. Rheumatic heart disease—comparison of diagnoses on the same person by two Special Examinations

Special Examination 1	Special Examination 2			
	Total	Positive	Suspect	Negative
Total--	80	3	1	76
Positive-----	3	3	0	0
Suspect------	1	0	0	1
Negative-----	76	0	1	75

Table 20. Other heart disease—comparison of diagnoses on the same person by two Special Examinations

Special Examination 1	Special Examination 2			
	Total	Positive	Suspect	Negative
Total--	80	0	1	79
Positive-----	2	0	0	2
Suspect------	4	0	1	3
Negative-----	74	0	0	74

agreed on this diagnosis in 10 cases. Seven of these occurred among the 14 cases where the first Special Examination disagreed with the Clinical Examination. Only 3 disagreements between the replicate examinations occurred among the 66 cases where the Special and Clinical Examinations were in diagnostic agreement. This point is further exemplified by the data on organic heart disease (irrespective of specific type) (table 16). Of the 64 cases in which the Clinical and first Special Examinations agreed, the two Specials disagreed in only 6. Of the 16 cases in which the Clinical and first Special Examination disagreed, the two Specials disagreed in 8.

It is evident that ECG interpretation played a critical role in diagnosis and differential diagnosis. It was a major source of diagnostic disagreements between the Clinical and Special Examinations. In this regard, a comment is in order on one aspect of the method used by the Special Examination. As already noted, the electrocardiographer read the tracing first without, and then with, access to summary clinical data giving blood pressure and initial diagnostic impression. As a result of referral to these clinical findings, ECG interpretation was changed in only 2 cases. This reinterpretation, as well as reinterpretations of the ECG and X-ray by the examining or reviewing physicians, seemed to add little to the achievement of diagnostic agreement between examinations.

Other cardiovascular diagnoses and findings in the two Special Examinations.—The two examinations agreed on the 1 case of cerebrovascular

Table 21. Number of persons with noncardiac cardiovascular diagnoses and with various cardiovascular findings: replicate Special Examinations

Findings	Special Examination	
	#1	#2
Noncardiac diagnoses		
Peripheral vascular disease	17	27
Cerebrovascular disease----	1	1
Physical examination		
Hypertensive retinopathy---	20	9
Significant murmur---------	11	11
History		
Angina pectoris----------	6	8
Myocardial infarction------	6	5
Cardiac dyspnea----------	11	4
Intermittent claudication--	5	5

NOTE: Same electrocardiogram and X-ray used for both Special Examinations.

Table 22. Hypertension—comparison of diagnoses on the same person by two Special Examinations

Special Examination 1	Special Examination 2			
	Total	Positive	Suspect	Negative
Total--	80	9	2	69
Positive-----	6	6	0	0
Suspect------	0	0	0	0
Negative-----	74	3	2	69

disease among this group of 80 patients (table 21). Peripheral vascular disease was diagnosed in 17 cases by the first Special Examination and in 27 by the second. The first Special Examination found hypertensive retinopathy in 20 instances, whereas the second Special Examination reported it in only 9 cases. The first Special Examination reported cardiac dyspnea in 11, the second in 4 cases. The former found hypertension, positive or suspect in 11 cases, the latter in 6 (table 22). The other major cardiovascular findings were recorded about as frequently by one Special Examination as the other (table 21). Although the same electrocardiographic and X-ray reports were used on both Special Examinations, on occasion the examining and reviewing physicians of the two examinations interpreted these identical findings differently in relation to data from other parts of the examination.

SPECIAL DIAGNOSTIC PROBLEMS

Several diagnostic problems emerged during the study. A major one involved evaluation of the LHS-LVH patterns on ECG. The Clinical Examination tended to interpret this finding as warranting a diagnosis of CHD plus HHD in hypertensive patients. In contrast, the Special Examination interpreted the pattern of LHS-LVH as inadequate for diagnosing CHD in these cases, regarding it as consistent with a diagnosis of HHD only. An extensive discussion of this complex question of the diagnostic interpretation of LHS-LVH patterns is beyond the scope of this report. To deal only briefly with this problem, it has been shown that these electrocardiographic patterns are associated with a several-fold increase in the risk of occurrence of myocardial infarction.[13,14] This observation indicates that severe coronary atherosclerosis is present in a significant percent of patients with such patterns. Autopsy evidence on persons with hypertensive heart disease is consistent with this inference.[15-17] It is therefore not unreasonable for clinicians to make a presumptive diagnosis of HHD plus CHD in hypertensive patients with LHS-LVH patterns on the electrocardiogram. On the other hand, the electrocardiographic diagnosis of definite CHD has traditionally required additional changes, particularly QRS changes, including Q waves of appropriate amplitude and duration.[8-12, 18-20] The Special Examination explicitly required such accepted manifest signs of coronary heart disease in order to make the diagnosis. Whatever the etiology attributed to a pattern of LHS-LVH on the electrocardiogram, the finding seems an adequate basis for diagnosing definite, rather than suspect, heart disease.

A second problem concerned the finding of aortic stenosis. In 4 cases the Special Examination diagnosed definite aortic stenosis without committing itself to an etiologic diagnosis (e.g., congenital, rheumatic, or atherosclerotic aortic stenosis). In these 4 cases the diagnoses of the Clinical Examination were all definite heart disease, coronary, rheumatic, or hypertensive. Two of these 4 cases were reexamined in the series of replicate Special Examinations and assigned the diagnosis of suspect coronary heart disease and suspect rheumatic heart disease, respectively. Aside from the problem of diagnostic disagreement, the long-standing problem of the etiopathologic processes producing aortic stenosis arises.[18,19] For population surveys and epidemiologic studies it is important that an approach be agreed upon for the categorization of such cases. It may be advisable to keep a category, aortic stenosis, without an etiologic diagnosis, for cases where determination of etiopathogenesis is difficult or impossible. It should further be noted that stenotic aortic valvular disease must be clearly differentiated from coronary heart disease, and from aortic sclerosis (aortic calcification on X-ray). These are distinct entities. The diagnosis of aortic stenosis or sclerosis does not warrant a concomitant diagnosis of coronary heart disease.

A third problem centers on the diagnosis of hypertension. For the Clinical Examination this was left to the discretion of the examining and reviewing physicians. In contrast, the Special Examination defined borderline (suspect) hypertension as a diastolic blood pressure of 90-94, definite (positive) hypertension as a diastolic pressure of 95 or more, on the lowest of four readings. As is well known, casual blood pressure readings may be labile, with a tendency to drop on repeated readings. This was the reason for taking several blood pressures during the Special Examinations. For the purposes of a single-visit examination, the interpretation was made that the lowest blood pressure was the most significant for the diagnosis of hypertension. (In a few instances the Special Examination diagnosed hypertension based on the history, even in the absence of currently diagnostic blood pressure levels.)

Several other ways of assessing the blood pressure data were examined. Choice of a higher or lower cutting point for defining hypertension obviously influenced the frequency of reported hypertension and the amount of agreement with

Table 23. Hypertension—effect of number of blood pressures taken on Special Examination and of different criteria on the comparison with findings on the Clinical Examination

Criteria on Special Examination and blood pressures used	Hypertensive			Nonhypertensive		
	Number on		Percent agreement of Special with Clinical Examinations[1]	Number on		Percent agreement of Special with Clinical Examinations[2]
	Special Examinations	Both Examinations		Special Examinations	Both Examinations	
Diastolic blood pressure ≥ 90 on lowest blood pressure						
Blood pressure #1	87	33	73.3	208	196	78.4
Blood pressure #1,2	76	31	68.9	219	205	82.0
Blood pressure #1,2,3	70	30	66.7	225	210	84.0
Blood pressure #1,2,3,4	69	30	66.7	226	212	84.8
Diastolic blood pressure ≥ 95 on lowest blood pressure						
Blood pressure #1	57	25	55.6	238	218	87.2
Blood pressure #1,2	47	24	53.3	248	227	90.8
Blood pressure #1,2,3	43	23	51.1	252	230	92.0
Blood pressure #1,2,3,4	41	22	48.9	254	231	92.4
Diastolic blood pressure ≥ 100 on lowest blood pressure						
Blood pressure #1	45	22	48.9	250	227	90.8
Blood pressure #1,2	36	19	42.2	259	233	93.2
Blood pressure #1,2,3	32	18	40.0	263	236	94.4
Blood pressure #1,2,3,4	32	18	40.0	263	236	94.4

NOTE: One person had only a single blood pressure taken. Of the remaining 295 persons, 45 were considered hypertensive, 250 as nonhypertensive by the Clinical Examination. Five persons were considered hypertensive on the Special Examination on the basis of history alone. These persons are not counted as hypertensive here.

[1]The number hypertensive on both examinations divided by the number hypertensive on the Clinical Examination.

[2]The number nonhypertensive on both divided by the number nonhypertensive on the Clinical Examination.

the Clinical Examination diagnosis. Use of three blood pressures instead of four made little difference in the results. However, use of only the first blood pressure had a significant influence, in terms of total counts. Thus, with a diastolic level of 95 or more mm Hg. as the criterion for hypertension, 19.3 percent (57 patients) had hypertension, based on the first reading, 15.9 percent based on the lower of two readings, 14.6 percent and 13.9 percent based on the lowest of three and four readings, respectively (table 23). The Clinical Examination reported 45 patients (15.2 percent) as hypertensive. With a single reading and a diastolic level of 100 mm Hg. or more as the criterion for hypertension, the Special Examination found 45 hypertensives (15.3 percent), thus corresponding closely in total counts to the results of the Clinical Examination (table 23). However, none of these alternate procedures was materially superior in terms of enhancing agreement on the diagnosis of hypertension in individual cases.

An additional problem in the diagnosis of hypertension arises where a history of hypertension is elicited in the absence of elevated blood pressure. The systematic handling of such data was not provided for by the Special Examination. Such standardization should be incorporated in medical examinations for health surveys and epidemiological studies. It should include provision

for cases with a history of hypertension and current antihypertensive treatment, with normotensive blood pressure readings.

Funduscopy was apparently of limited accuracy in diagnosing hypertensive vascular disease, since normotension was found in a sizable number of patients with "hypertensive retinopathy." Based on the data of this study, it is not possible to offer more than speculative explanations for these discrepant findings. Lack of pupillary dilatation may have been a factor, as well as the minimal nature of the funduscopic findings in these ambulatory patients. Perhaps the term hypertensive retinopathy is inappropriate to categorize the type of changes seen in many of these patients. Additional research in this area would seem to be indicated.

Another diagnosis yielding a low level of agreement between examinations was peripheral vascular disease. When a history of intermittent claudication could be elicited, diagnostic agreement was greater. In the absence of this pathognomonic symptom, reliance had to be placed upon physical examination findings, particularly absent or diminished pulsations on palpation of posterior tibial, dorsalis pedis, popliteal, and/or femoral arteries. It would appear that caution is indicated in diagnosing peripheral vascular disease based on palpatory findings alone. Perhaps auxiliary procedures, e.g., oscillometry and/or X-ray of the lower extremities to determine presence of arterial calcification, might enhance diagnostic accuracy.[21,22] Further work would appear to be in order to improve diagnostic accuracy in this area for purposes of field surveys and epidemiological studies.

Several criteria problems were dealt with by establishing standard rules for the Special Examination. Thus, calcification of the aorta on X-ray was not considered as evidence of coronary heart disease, although the Nomenclature and Criteria for Diagnosis of Diseases of the Heart and Blood Vessels lists this as a criterion.[8] Left bundle branch system block on the electrocardiogram was interpreted as evidence of definite heart disease, while right bundle branch system block, first degree atrioventricular block, and nonspecific ST-T changes were evaluated as warranting a diagnosis of suspect heart disease.[8, 9, 19-20] Auricular fibrillation without any other signs of heart disease was also regarded as justifying a diagnosis of suspect heart disease. In most cases this abnormality was found in persons with other findings indicative of one or another type of definite organic heart disease. A history of myocardial infarction was interpreted as warranting a suspect diagnosis of coronary heart disease on a single-visit examination without recourse to earlier records.

It was difficult to apply diagnostic rules with complete consistency, and a few instances arose where the Special Examination failed to adhere to its own criteria. The problem was even more difficult with respect to certain individual findings; for these a standardized disposition was badly needed. These included: A history of arrhythmia without arrhythmia on the examination; angina pectoris and rheumatic heart disease concurrently, with or without arrhythmia; borderline hypertension in the presence of definite heart disease; definite hypertension with nonspecific electrocardiographic abnormalities; borderline electrocardiographic tracings; suspect heart enlargement, with or without hypertension, with or without positive cardiac findings from other parts of the examination.

GENERAL COMMENTS AND DISCUSSION

Ideally, it would have been desirable to base a study of this kind on a set of cases diagnosed with absolute certainty. In practice, this was not possible. In some instances, to be sure, the evidence of disease was so definitive as to render a specific diagnosis highly probable; but in many instances this was not the case. Nor were generally verified and accepted criteria always available or consistently used—a subject touched on in the previous section. Perforce, then, this report has deliberately skirted the question of validity for the larger part and focused on various factors influencing diagnostic variability.

The sources of disagreements delineated in this study would appear to be of considerable importance in relation to work on the cardiovascular diseases. Thus, for coronary heart disease the two main sources of diagnostic disagreement were the medical history with respect to angina pectoris and the reading and interpretation of the electrocardiogram. In hypertensive heart disease, differences in blood pressure at separate examinations and in the reading and interpretation of the electrocardiogram were the two leading causes of diagnostic disagreement. For rheumatic heart disease, auscultation for heart murmurs was the major source of diagnostic disagreement. Interpretation of the X-ray was a minor factor in accounting for observed disagreements. In general, these sources of disagreement fairly well met expectations.

In the assessment of variability—both between the Clinical and Special Examinations, and between the two Special Examinations—it would have been valuable to know the variability of the Clinical Examination per se. Again, this was a practical impossibility.

In an evaluation of this kind, it would also have been desirable to bring under study all forms and stages of the diseases being investigated. Clearly the plan of the present study placed limitations upon the achievement of this objective. For one thing, an ambulatory population of employed persons was examined. Thus, those hospitalized or otherwise bedridden as a result of cardiovascular diseases were not included. Obviously the very nature of the study also precluded evaluation of diagnostic variability in relation to lethal episodes—by no means rare manifestations of the cardiovascular diseases. In short, the study omitted from its consideration a substantial part of the more severe manifestations of the cardiovascular diseases.

This project was undertaken to evaluate a standardized cardiovascular examination procedure for diagnostic use in field surveys and epidemiologic investigations. Therefore, an additional desideratum would have been a study group similar in composition to the population strata usually investigated—similar both in demographic characteristics and in disease prevalence rates. Such a match is seldom possible, if for no other reason than the variety of populations under study. Nor is it an economical study method.

Since the group of examinees was not representative of the general population or its strata, the possible effects of this on the results of this study need to be considered, if only inferentially. For example, a physician's level of suspicion may vary according to the age and sex of the person he examines and according to the frequency with which disease is encountered in the study group. For another example, a physician's ability to communicate with the patient may vary according to the patient's cultural background and education. These and other such factors may affect the results of the examination. For the present study, it may be particularly relevant to take cognizance of the fact that the examinees were deliberately selected to include a relatively high proportion of persons—all ambulatory and free living—with cardiovascular diseases.

Possible consequences of this selection may be appreciated by considering one of the usual simplifying models for diagnostic studies. Suppose the population to be divided into three classes—those truly negative for disease, those with borderline or mild forms of disease, and those with distinct, well-defined or severe forms of disease. For the cardiovascular diseases it seems plausible to assume that the chance of an error in diagnosis is low for the truly negative cases, higher but still low for cases with severe forms of disease and considerably higher for the borderline or mild forms. If this be valid, drawing a study group from a largely well, or from a severely ill (e.g. hospitalized) population will lead to a high level of diagnostic agreement, whereas a heavy weighting of borderline or mild illness will lead to a high level of disagreement. Because of the method of selection, there is reason to believe that the examinee group in this study was weighted with persons having borderline or mild forms of cardiovascular illness.

With these considerations in mind, it is worthwhile reviewing the status of diagnostic agreements and disagreements in this study. Altogether, in the comparison of the Clinical and Special Examinations, there was complete diagnostic agreement, including agreement on specific type of heart disease, in 208 of the 296 cases (70.3 percent) (table 5). There was agreement on the diagnosis of organic heart disease (although not necessarily on the specific type of heart disease) in 231 cases (78.0 percent). In another 52 cases (17.6 percent), disagreement was of the negative vs. suspect, or suspect vs. positive type; negative-positive disagreement—a type that might be categorized as complete disagreement—occurred in 13 cases (4.5 percent).

As previously indicated, the diagnostic disagreements between the Clinical and Special Examinations were in certain aspects not random, particularly with respect to diagnoses of specific types of heart disease. The Special Examination exhibited a higher level of suspicion on the medical history and the physical examination, and a lower level of suspicion on the electrocardiogram than did the Clinical Examination. In other words, the standards and criteria of the two examinations were in certain respects different. The result was a degree of nonrandom disagreement in specific diagnoses. Again, this fact is noted, without attempting to arrive at any evaluation with respect to validity. This observation reinforces the importance of a well-known precept, i.e., that field surveys and epidemiological studies must use standardized procedures and generally acceptable uniform criteria.

The single-visit examination does, theoretically, have a limitation: it cannot build up baselines of normality for the individual against which pathologic changes can be measured and it cannot deflate suspicious findings by long-term observation. This appears to be only a minor source of the differences between the Clinical and Special Examinations.

With respect to the over-all diagnosis of organic heart disease (irrespective of specific

type), the levels of variability between the Clinical and Special, and between the two Special Examinations were generally similar. These corresponding levels of agreement and disagreement suggest—although they cannot prove—that they are in the main due to the variability inherent in cardiovascular medical procedures in ambulatory adult subjects.

The specific levels of agreement and disagreement observed in this study have only limited significance, in terms of their generalizability. Nevertheless, for reasons indicated in the foregoing comments on a simplifying model, it seems valid to infer that similar or better levels of diagnostic agreement would obtain if this study were repeated under conditions prevailing in field surveys and epidemiological studies. More particularly, it appears likely that repeated efforts under a wide variety of circumstances would consistently yield a low level of negative-positive disagreements for the diagnosis of organic heart disease (uniformly less than 5 percent in this study). This is to be expected in view of the standardized and comprehensive nature of the Special Examination, in terms of fundamental contemporary cardiovascular diagnostic procedures and criteria. Therefore, it may be reasonably concluded that this examination procedure is satisfactory in reliability and accuracy for field surveys and epidemiological studies.

SUMMARY AND CONCLUSIONS

A single-visit cardiovascular examination (the Special Examination) was developed and evaluated.

This examination was found to yield cardiovascular diagnoses comparable to those obtained by a complete medical workup in good clinical practice (the Clinical Examination).

There was, however, a clear difference in the criteria and standards of the two examinations, as evidenced by a higher level of findings on the medical history and physical examination as administered by the Special Examination and a lower level of electrocardiographic abnormalities than on the Clinical Examination.

The chief diagnostic discrepancy was in the diagnosis of coronary heart disease. While the Special Examination found more cases of angina pectoris than the Clinical, this was distinctly overbalanced by a greater number of electrocardiographic abnormalities considered to indicate coronary heart disease on the Clinical Examination.

Only a relatively small proportion of the diagnostic disagreements suggested inadequacies in the Special Examination.

The Special Examination uncovered some problems in standardization that had not been clearly recognized or provided for at the beginning. These were chiefly with respect to diagnostic criteria and the disposition of certain findings. Minor modifications in criteria are needed to provide for these.

Replication of 80 Special Examinations demonstrated that the procedure was reliable. A large part of the diagnostic differences noted between the Special and Clinical Examinations arose from the variability inherent in cardiovascular medical procedures in ambulatory adult subjects.

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EXAMINING PHYSICIANS, CLINICAL EXAMINATION

Gold Cross Organization—A. J. Miller, M. D. and T. A. Texidor, M. D., Medical Directors.

Chicago Health Center of the International Ladies Garment Workers Union—S. E. Telser, Medical Director (deceased); J. Cohen, M. D.; J. Edinburg, M. D.; M. Gethner, M. D.; H. Hershfield, M. D.; M. Kadin, M. D.; L. Kaplan, M. D.; J. Meyer, M. D.; S. Strauss, M. D.; and S. Weisberg, M. D.

Union Health Service—H. K. Abrams, M. D., Medical Director; A. Black, M. D.; B. W. Carnow, M. D.; A. Creticos, M. D.; M. Franklin, M. D.; W. Freud, M. D.; M. Hall, M. D.; G. Podzamsky, M. D.; S. Presley, M. D.; P. Warsaw, M. D.; Q. D. Young, M. D.

APPENDIX I

FORMS USED IN METHODOLOGICAL STUDY

M.S. #001 - 12/57

MICHAEL REESE SPECIAL STUDY
MEDICAL HISTORY FORM

Col.#

Date_____

(1-5) ☐ Study #

Name_____

(6) [1] Form #

(7-8) ☐ Age

(9)

Male	Female
1 ☐ White	4 ☐ White
2 ☐ Negro	5 ☐ Negro
3 ☐ Other	6 ☐ Other

(10) ☐ Employed
Occupation_____
No. of years_____
8 ☐ Housewife
9 ☐ Other

(11)
1 ☐ Native born_____ (state)
2 ☐ Foreign born_____ (country)

Have you ever had:

		Yes-Age*	No*	R	Comments: Interviewer (Check R for recurrence)	Comments: M.D.
(12)	Scarlet fever	☐	☐			
(13)	Rheumatic fever	☐	☐	☐		
(14)	Pneumonia	☐	☐	☐		
(15)	Asthma	☐	☐	☐		
(16)	Diabetes	☐	☐			
(17)	Liver disease	☐	☐	☐		
(18)	Stroke	☐	☐	☐		
(19)	Rheumatism or arthritis	☐	☐	☐		
(20)	Gout	☐	☐	☐		
				Surgery		
(21)	Gallbladder trouble	☐	☐	☐		
(22)	Stomach ulcers	☐	☐	☐		
(23)	Thyroid trouble	☐	☐	☐		
(24)	Tuberculosis	☐	☐	☐		
(25)	Kidney trouble	☐	☐	☐		

*

CODE	
No	1
Yes - Age 1 to 14	2
Yes - Age 15 to 24	3
Yes - Age 25 to 44	4
Yes - Age 45 plus	5

Col.# | Comments: Interviewer | M.D.

1 Yes 2 No

(26) Were you ever turned down by an insurance company for medical reasons? ☐ ☐

Reason_____

(27) Have you ever served in the armed forces? ☐ ☐

(28) If no, were you turned down for medical reasons? ☐ ☐

If yes, years:_____to_____

☐U.S. ☐Other

(29) Were you discharged for medical reasons? ☐ ☐

If yes, specify_____

_____

(30) Do you have a disability pension? ☐ ☐

If yes, specify_____

_____

Family record	Where born	Age if living	Condition of health (if not "good," give details)	Age at death	Cause of death
Father					
Mother					
Brothers No. who died before age 21 ☐ Ask on all others:					
Sisters No. who died before age 21 ☐ Ask on all others:					

Col.# | Comments: Interviewer | M.D.

1 Yes 2 No

(31) Did a doctor ever tell you that you had heart trouble? ☐ ☐

If yes, what did he call it?_____

_____

Age_____

Comments

Interviewer | M.D.

Col.#

	Yes	No
If yes, were you hospitalized?	☐	☐
When?_____ How long?_____		
Surgery?	☐	☐
Describe_____		
Have you ever taken any medicine for heart trouble?	☐	☐

If yes, did you take the medicine:

☐ Under the tongue

☐ By swallowing

☐ By injection

☐ Other_____ (specify)

Do you take it now?	☐	☐
(32) Did a doctor ever tell you that you had high blood pressure?	☐	☐
Age_____		
If yes, were you hospitalized?	☐	☐
When_____ How long?_____		
Surgery?	☐	☐
Describe_____		
(33) Have you ever taken any medicine for high blood pressure?	☐	☐
If yes, when?_____		
For how long?_____		
Do you take it now?	☐	☐

(34) M.D.: BELIEVES PATIENT IS ON ANTI-PRESSOR THERAPY (FROM MEDICAL HISTORY) 1 ☐ YES 2 ☐ NO 3 ☐ D.K.

	Yes	No
Do you become short of breath when:		
Climbing stairs	☐	☐
Excercising	☐	☐
Excited	☐	☐
Hss shortness of breath ever wakened you at night?	☐	☐

(35) M.D. CARDIAC DYSPNEA PRESENT (FROM HISTORY) 1 ☐ YES 2 ☐ NO 3 ☐ SUSPECT

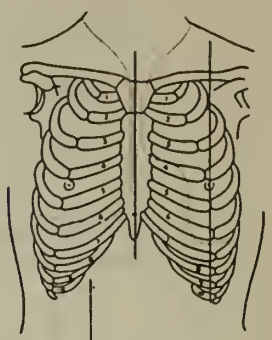
	Yes	No
Do you cough frequently?	☐	☐
Do you cough up anything?	☐	☐
If yes, ☐ Mucous ☐ Blood		

Col. #

Comments

Interviewer | M.D.

	Yes	No
Have you ever had any discomfort in your chest?	☐	☐
If yes, is it ☐ pain ☐ pressure ☐ burning ☐ squeezing ☐ other_____		
How recently? _____		
Where do (did) you have this pain(or discomfort)? (locate on diagram) Does (did) it stay in one place? (If pain usually moves, indicate with dotted line)	☐	☐
How long does it last?_____		
Does pain occur at any special time?	☐	☐
After meals?	☐	☐
When you exercise?	☐	☐
When you walk in cold, windy weather?	☐	☐
When you are upset or nervous?	☐	☐
Other?_____ (specify)		
Does anything relieve the pain?	☐	☐
Rest?	☐	☐
Soda bicarbonate?	☐	☐
Other_____ (specify)		



(36) M.D.: ANGINA PECTORIS PRESENT (FROM HISTORY)
1 ☐ YES 2 ☐ NO 3 ☐ SUSPECT

Do you have pains or cramps in your legs when you walk?	☐	☐
If yes, is pain relieved when you stop walking?	☐	☐

(37) M.D.: INTERMITTENT CLAUDICATION PRESENT
1 ☐ YES 2 ☐ NO 3 ☐ SUSPECT

Are your ankles swollen at bedtime?	☐	☐
If yes, does the swelling disappear by morning?	☐	☐
Do you have frequent headaches?	☐	☐
If yes, are they worse in the early morning?	☐	☐
Do you ever have blurring of your vision?	☐	☐

Col.# | Comments: Interviewer | M.D.

Do you have: Yes ☐ No ☐

- Stiff joints in the morning? ☐ ☐
- Joint pains? ☐ ☐
- Joint tenderness? ☐ ☐
- Joint swelling? ☐ ☐

(38-40) What is your usual weight?_____lbs.

(41) Have you gained or lost more than 5 lbs. in the last 6 months? 1 ☐ 2 ☐

(42-44) How much?_____lbs.

(45) 1 ☐ Gained 2 ☐ Lost

(46-48) What was your weight at age 25?_____lbs.

(49) Are you now on any special diet? 1 ☐ 2 ☐

If yes, is it:

- To lose weight? ☐ ☐
- For heart trouble? ☐ ☐
- For high blood pressure? ☐ ☐
- For ulcers? ☐ ☐

Other_____

Have you ever smoked? ☐ ☐

If yes, did you smoke:

- ☐ Cigarettes
- ☐ Cigars
- ☐ Pipe

Other_____

How old were you when you started smoking regularly? ☐☐ Years

Do you smoke at the present time? ☐ ☐

If no, why did you stop smoking?

_____

Give an estimate of how much you smoke (d)?

_____cigarettes a day

_____cigars a day

_____pipesfull a day

Is this more ☐ less ☐ about the same ☐ as you have been smoking for the last ten years?

Estimate how many years you have smoked regularly? _____

Col.#		Comments: Interviewer	M.D.
(50)	☐ Smoking status		
(51-52)	Height_____inches		
(53-55)	Weight_____pounds		
	Interviewer comments:	Yes	No
	Language difficulty	☐	☐
	Cooperstive	☐	☐
	Apprehensive	☐	☐
	Interruptions	☐	☐
	Other_____		
	_____		
(56)	☐ Code #	_____ (Initisls)	

MS-002

MICHAEL REESE SPECIAL STUDY PHYSICAL EXAMINATION RECORD

(1-5) STUDY NUMBER

(6) 2 FORM NUMBER

DATE

NAME

HAIR (Scalp)

(7)
1 ☐ FULL GROWTH
2 ☐ RECEDING FOREHEAD
3 ☐ RECEDING FOREHEAD - BALD SPOT
4 ☐ BALD DOME

EYES

(8) ARCUS SENILIS YES 1 ☐ NO 2 ☐

(9) XANTHELASMA YES 1 ☐ NO 2 ☐

PUPILS
- EQUAL - REACT TO LIGHT AND ACCOM. YES ☐ NO ☐
- PUPIL ABNORMALITY YES ☐ NO ☐
- SPECIFY

FUNDI

	RIGHT	LEFT
NORMAL	☐	☐
INCREASED LIGHT REFLEX	☐	☐
NARROW ARTERIOLES	☐	☐
TORTUOUS ARTERIOLES	☐	☐
A-V COMPRESSION	☐	☐
HEMORRHAGE	☐	☐
EXUDATE	☐	☐
VENOUS ENGORGEMENT	☐	☐
PAPILLEDEMA	☐	☐
DISC ABNORMALITIES	☐	☐
LENS OPACITIES	☐	☐
OTHER (SPECIFY)	☐	☐

(10) K-W GRADE 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐

NECK

VENOUS ENGORGEMENT (UPRIGHT) YES ☐ NO ☐

THORAX AND LUNGS

TACHYPNEA YES ☐ NO ☐

P-A DIAMETER INCREASED YES ☐ NO ☐

DIAPHRAGM MOTION DECREASED YES ☐ NO ☐

		R.	L.	LOCALIZE ABNORMALITY
PERCUSSION	RESONANT	☐	☐	
	DULL	☐	☐	
BREATH SOUNDS	NORMAL	☐	☐	
	BRONCHIAL	☐	☐	
	DIMINISHED OR ABSENT	☐	☐	
ADVENTITIOUS SOUNDS	NONE	☐	☐	
	INSP. RALES	☐	☐	
	EXP. RALES	☐	☐	
	INSP. WHEEZES	☐	☐	
	EXP. WHEEZES	☐	☐	
	OTHER	☐	☐	

HEART

APICAL IMPULSE
- CHARACTER
  - NORMAL ☐
  - FORCEFUL ☐
  - NOT FELT ☐
- LOCATION
  - INSIDE MCL ☐
  - OUTSIDE MCL ☐
  - INTERSPACE 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐

THRILLS
- NONE ☐
- AORTIC SYSTOLIC ☐
- APICAL SYSTOLIC ☐
- PULM. SYSTOLIC ☐
- AORTIC DIASTOLIC ☐
- APICAL DIASTOLIC ☐
- PULM. DIASTOLIC ☐
- OTHER ☐ (SPECIFY)

(11-13) APICAL RATE ☐☐☐

(14) RHYTHM
- REGULAR 1 ☐
- OCCASIONAL PREMATURE BEATS 2 ☐
- FREQUENT PREMATURE BEATS 3 ☐
- ATRIAL FIBRILLATION 4 ☐
- GALLOP 5 ☐
- OTHER (SPECIFY) 6 ☐

(15) HEART TONES
- NORMAL YES 1 ☐ NO 2 ☐
- DISTANT ☐
- A_2 ACCENTUATED ☐
- P_2 ACCENTUATED ☐
- M_1 ACCENTUATED ☐
- M_1 AND P_2 ACCENTUATED ☐
- A_2 DIMINISHED TO ABSENT ☐
- P_2 DIMINISHED ☐
- OTHER ☐ (SPECIFY)

(16) SIGNIFICANT MURMURS

SYSTOLIC YES 1 ☐ NO 2 ☐

	GRADE 1-6	CHARACTER & TRANSMISSION
APICAL ☐		
MID PRECOROIAL ☐		
PULMONIC ☐		
AORTIC ☐		

(17) DIASTOLIC YES 1 ☐ NO 2 ☐

	CHARACTER	TIMING
APICAL ☐		
MID PRECORDIAL ☐		
PULMONIC ☐		
AORTIC ☐		

(18) NON-SIGNIFICANT MURMURS
- PRESENT YES 1 ☐ NO 2 ☐
- SPECIFY

LOWER EXTREMITIES

		RIGHT	LEFT
COLOR	NORMAL	☐	☐
	DEPENDENT RUBOR	☐	☐
	PALLOR	☐	☐
TEMPERATURE	NORMAL	☐	☐
	COOL	☐	☐
SKIN TURGOR	NORMAL	☐	☐
	POOR	☐	☐
VARICOSITIES	ABSENT	☐	☐
	PRESENT	☐	☐
DEPENDENT EDEMA	ABSENT	☐	☐
	PRESENT	☐	☐

PERIPHERAL ARTERIES

QUALITY OF ARTERIAL PULSATIONS

	RIGHT	LEFT
RADIAL ARTERY		
NORMAL	☐	☐
BOUNDING	☐	☐
DORSALIS PEDIS		
NORMAL	☐	☐
DIMINISHED	☐	☐
NOT PALPABLE	☐	☐
POST·TIBIAL		
NORMAL	☐	☐
DIMINISHED	☐	☐
NOT PALPABLE	☐	☐

(19) INSPECTION AND PALPATION (20)

SUPERFICIAL TEMPORAL ARTERIES	
NORMAL 1	☐
SCLEROTIC 2	☐
TORTUOUS 3	☐
BRACHIAL ARTERY	
NORMAL 1	☐
SCLEROTIC 2	☐
TORTUOUS 3	☐

(21)

RADIAL ARTERY	
NORMAL 1	☐
SCLEROTIC 2	☐

BODY MASS

(22-27) SKINFOLD THICKNESS ____ ☐☐

(28-29) INTERACROMIAL DISTANCE ____ ☐☐

(30-31) INTERCRISTAL DISTANCE ____ ☐☐

BLOOD PRESSURE

(29-34)	☐/☐	RIGHT ARM
(38-43)	☐/☐	LEFT ARM
(44-49)	☐/☐	LEFT ARM (10 MIN.)
(50-55)	☐/☐	LEFT ARM (15 MIN.)

(56) **DIAGNOSTIC IMPRESSION**

NEGATIVE FOR C-V-R DISEASE (INCLUDING HYPERTENSION) ____ 1 ☐

HYPERTENSION ____ 2 ☐

PERIPHERAL ARTERIOSCLEROSIS ____ 3 ☐

ORGANIC HEART DISEASE ____ ☐

ETIOLOGY ____

PATHOLOGY ____

PHYSIOLOGY ____

FUNCTIONAL ____

OTHER ____

COMMENTS: YES 1 ☐ NO 2 ☐

(57)

EXAMINER'S CODE NO. ☐

____ M.D.
SIGNATURE

0-004-1067

ELECTROCARDIOGRAPHIC INTERPRETATION

STUDY CODE #_____ NO. OF LEADS _____ DATE_____

1. Rate _____

2. P-R _____

3. QRS _____

4. Description:
   Abnormalities: Yes_____ No _____
   Possible Abnormalities: Yes_____ No_____
   Normal Variants: Yes_____ No_____

   If yes in any of the above, Specify:
   Contour: P wave _____
   QRS _____
   ST segment _____
   T wave _____
   Rhythm: Auricular fibrillation _____
   Other_____

5. General Impression:
   Within normal limits_____
   Borderline curve_____
   Definitely abnormal curve_____

6. Contour interpretation:
   Specific pattern: Yes_____ No_____
   Definite infarct pattern_____
   Left heart strain_____
   Right heart strain_____
   Left bundle branch system block_____
   Right bundle branch system block_____
   Digitalis effect_____
   Other_____ Specify_____
   Contour non-specific: Yes_____ No_____

7. Impression as to etiology:
   Definite coronary artery disease_____
   Possible coronary artery disease_____
   Apparently unrelated to coronary artery disease_____

8. Clinical correlation:
   ECG correlates with clinical findings_____
   ECG does not correlate with clinical findings _____
   Interpretation changed on basis of clinical findings_____

9. Correlation with previous ECG interpretation: Yes_____ No_____

_____M.D.

G-008-1157

MICHAEL REESE SPECIAL STUDY
X-RAY INTERPRETATION

( ) Study Code

( ) X-Ray Number

( ) Date X-Ray Taken

( ) Age

NAME _____

( ) 1 ☐ Normal
2 ☐ Abnormal

( ) ABNORMALITIES OF HEART

1 ☐ None
2 ☐ Cardiomegaly
3 ☐ Pulmonary Artery Segment Prominent
4 ☐ Left Ventricular Enlargement
5 ☐ Left Atrial Enlargement
6 ☐ Other _____ (Specify)
9 ☐ Unreadable Because _____

( ) ABNORMALITIES OF PULMONARY VASCULARITY

1 ☐ None
2 ☐ Increased
3 ☐ Pulmonary Edema
4 ☐ Decreased
9 ☐ Other _____ (Specify)

( ) ABNORMALITIES OF PLEURA

1 ☐ None
2 ☐ Calcification
3 ☐ Pleural Effusion
4 ☐ Pleural Scarring
9 ☐ Other _____ (Specify)

NOMOGRAPHIC EVALUATION OF HEART SIZE

Height _____ Weight _____
Transverse Diameter _____
Long Diameter _____
Broad Diameter _____
Unmeasurable Because _____

( ) ☐
( ) 1 ☐ Heart Within Normal Limits
2 ☐ Borderline Cardiomegaly
3 ☐ Cardiomegaly

( ) C/T Ratio _____

( ) ABNORMALITIES OF AORTA

1 ☐ None
2 ☐ Elongation
3 ☐ Calcification Ascending Aorta
4 ☐ Calcification Other Portions Aorta
5 ☐ Aneurysm
9 ☐ Other _____ (Specify)

( ) ABNORMALITIES OF PULMONARY PARENCHYMA

1 ☐ None
2 ☐ Tuberculosis
3 ☐ Non-Tuberculosis Infiltrate
4 ☐ Neoplasm
5 ☐ Coin Lesion
6 ☐ Chronic Bronchopulmonary Disease
7 ☐ Pneumoconiosis
8 ☐ Atelectasis
9 ☐ Other _____ (Specify)

( ) OTHER ABNORMALITIES

1 ☐ None
2 ☐ Mediastinal Mass
3 ☐ Elevated Diaphragm
4 ☐ Rib Fracture
5 ☐ Rib Anomaly
6 ☐ Scoliosis
7 ☐ Post-Operative Deformity
9 ☐ Other _____ (Specify)

_____ M.D.
Signature

M. S. #003-12/57

MICHAEL REESE SPECIAL STUDY DIAGNOSTIC REPORT

Col.#

1-4 ☐ Study # 5 ☐ Dr. _____

Patient's name _____

6 ☐ Date of patient's most recent physical examination _____

Blood Pressure Data:

	Date	Pressure
Farliest recorded blood pressure:	_____	_____
Subsequent representative blood pressures:	_____	_____
	_____	_____
7 ☐	_____	_____

8 Has patient received anti-hypertensive drug therapy? 1 ☐ Yes 2 ☐ No

If yes: From _____ to _____

Continuous _____ intermittent _____

Specify which drug _____

Representative blood pressures under therapy:	Date	Pressure
	_____	_____
	_____	_____
9 ☐	_____	_____

10 I. IS HEART DISEASE PRESENT OR SUSPECT? 1 ☐ Yes 2 ☐ No

If yes, etiology:

	Yes	No	Suspect
Coronary	☐	☐	☐
Hypertensive	☐	☐	☐
Coronary plus hypertensive	☐	☐	☐
Rheumatic	☐	☐	☐

11-12 ☐ Other _____

Basis of cardiac diagnosis:

	Yes	No
History	☐	☐
Physical	☐	☐
Electrocardiogram	☐	☐
13-14 ☐ X-ray	☐	☐

15 II. IS ESSENTIAL HYPERTENSION PRESENT? 1 ☐ Yes 2 ☐ No

(As differentiated from hypertensive heart disease)

16 III. IS URINARY TRACT DISEASE PRESENT? 1 ☐ Yes 2 ☐ No

Probably renal ☐ Yes ☐ No

Probably lower GU ☐ Yes ☐ No

17 ☐ Note any definitive diagnosis _____

Col.#

IV. IS THERE ANY EVIDENCE (PAST OR PRESENT) OF ANY OF THE FOLLOWING?

		Yes	No	Comments
18	Angina pectoris	1 ☐	2 ☐	
19	Other chest pain	1 ☐	2 ☐	
	Specify_____			
20	History of myocardial infarction	1 ☐	2 ☐	
21	Other significant cardiac history	1 ☐	2 ☐	
	Specify_____			
22	Dyspnea of cardiac origin	1 ☐	2 ☐	
23	Congestive failure (past)	1 ☐	2 ☐	
24	Congestive failure (present)	1 ☐	2 ☐	
25	Hypertensive retinopathy	1 ☐	2 ☐	
	Grade I II III IV			
26	Diabetic retinopathy	1 ☐	2 ☐	
27	Cardiac arrhythmia	1 ☐	2 ☐	
	Type _____			
28	Significant cardiac murmurs	1 ☐	2 ☐	
	Describe_____			
29	Nonsignificant cardiac murmurs	1 ☐	2 ☐	
	Describe_____			
30	Abnormal heart tones or thrills	1 ☐	2 ☐	
	Describe_____			
	ECG evidence of:			
31	Coronary heart disease	1 ☐	2 ☐	
32	Left heart strain (left ventricular hypertrophy)	1 ☐	2 ☐	
33	Nonspecific changes	1 ☐	2 ☐	
	Describe_____			
34	Other changes	1 ☐	2 ☐	
	Describe_____			
	X-ray evidence of:			
35	Cardiomegaly	1 ☐	2 ☐	
36	Aortic calcification	1 ☐	2 ☐	
37	Aortic elongation	1 ☐	2 ☐	
38	Chamber enlargement	1 ☐	2 ☐	
	Specify_____			
39	Urinary abnormalities	1 ☐	2 ☐	
	Specify_____			
40	Intermittent claudication	1 ☐	2 ☐	
41	Peripheral arteriosclerosis	1 ☐	2 ☐	
	Specify_____			
42	Cerebral-vascular accident	1 ☐	2 ☐	
43	Hypertensive vascular disease (without cardiac involvement	1 ☐	2 ☐	

V. ARE ANY OF THESE DISEASES PRESENT?

Col. #		Yes	No	Comments
44	Obesity	1 ☐	2 ☐	
45	Diabetes mellitus	1 ☐	2 ☐	
46	Gallbladder disease	1 ☐	2 ☐	
47	Thyroid disease Specify_____	1 ☐	2 ☐	
48	Other endocrine disorder Specify_____	1 ☐	2 ☐	
49	Arthritis Specify type_____	1 ☐	2 ☐	
50	Chronic bronchopulmonary disease	1 ☐	2 ☐	
51	Asthma	1 ☐	2 ☐	
52	Tuberculosis Specify activity_____ _____	1 ☐	2 ☐	
53	Other lung disease Specify_____ _____	1 ☐	2 ☐	
54	Hiatus hernia	1 ☐	2 ☐	
55	Liver disease Specify_____ _____	1 ☐	2 ☐	
56	Peptic ulcer	1 ☐	2 ☐	
57	Any other major disease	1 ☐	2 ☐	

Chicago Board of Health
HDCP

_____ M. D.
Signature

M. S. -#008-
12-57

Michael Reese Special Study

Physical Exam. Findings

Study Code #_____
Date of Special Exam._____
Blood Pressure_____
Age_____
Sex_____
Initial Diagnostic
Impression_____
_____

APPENDIX II

CARDIOVASCULAR DISEASES

CLASSIFICATION AND CRITERIA*

A. Hypertension:
   1. Hypertension, definite.— The lowest diastolic pressure in the sequence of readings at the time of examination is 95 mm Hg. or greater.
   2. Hypertension borderline.—The lowest diastolic reading during the series of readings at the time of examination is between 90 and 94 mm Hg. inclusive.

B. Heart disease, definite:
   1. Atherosclerotic coronary heart disease (CHD), definite.—This diagnosis rests with the finding of symptoms or abnormal physical signs indicating: atherosclerosis of coronary arteries, thrombosis or occlusion of one or more coronary branches, fibrosis of the myocardium. This category includes the following subcategories:
      a. Myocardial infarction, definite.—All cases with electrocardiographic evidence of definite QRS changes diagnostic of myocardial infarction with or without a concomitant clinical picture characteristic of myocardial infarction.
      b. Acute coronary insufficiency.—All cases with a typical clinical history of an acute coronary episode with either no electrocardiographic changes or electrocardiographic changes consisting of ST-T abnormalities without QRS abnormalities indicative of through and through infarction of the myocardium.
      c. Anginal syndrome, definite.—Those cases of unequivocal angina pectoris so diagnosed by the examining physician.
      d. Chronic heart disease, definite, of probable coronary etiology.—Those cases not classifiable into any of the preceding categories and exhibiting findings consistent with the etiologic diagnosis of chronic coronary disease. Such findings are those of unexplained congestive heart failure, murmur, cardiomegaly, arrhythmia, or electrocardiographic abnormalities.[1]
      e. Sudden death.—This category is obviously not relevant to this study.
   2. Hypertensive heart disease (HHD), definite.—Those cases of definite hypertension with one or more of the following: left ventricular hypertrophy or strain on the electrocardiogram, cardiomegaly on the X-ray, congestive heart failure without any other etiologic factors. (The New York Heart Association criteria for hypertensive heart disease read as follows: persistent hypertension associated with evidence of heart disease.)
   3. Rheumatic heart disease (RHD), definite.—A history of polyarthritis, chorea, or other of the major manifestations of rheumatic fever accompanied by a characteristic structural lesion of the heart. Or, evidence of a characteristic structural lesion of the heart even without a history of rheumatic fever or any of its manifestations. This diagnosis in essence is based on the physician's evaluation of the cardiac murmurs present in the patient.
   4. Syphilitic heart disease, definite:[2] This is characterized by: a history of syphilitic infection with evidence of a characteristic structural lesion of the aorta or aortic valve, or the characteristic structural lesion of the aorta or aortic valve with a history of syphilis or with a positive serological test, or a characteristic structural lesion of the aorta or aortic valve together with evidence of syphilitic disease elsewhere, such as cerebrospinal syphilis, even in the absence of a positive serological test for syphilis or history of syphilitic infection.
   5. Congenital heart disease, definite: This diagnosis is based on the finding of characteristic signs, on physical examination, X-ray, and ECG.
   6. Cor pulmonale, definite: This is best defined as right heart failure secondary to chronic pulmonary disease.
   7. Heart disease, definite—miscellaneous types:
      a. Thyrotoxic heart disease.
      b. Calcific aortic stenosis, etiology not specified.
      c. Nutritional heart disease.
      d. Chronic myocarditis.
      e. Organic heart disease of indeterminate etiology.

C. Heart disease, suspect:
   1. Atherosclerotic coronary heart disease, suspect:
      a. Myocardial infarction, suspect.
      b. Acute coronary insufficiency, suspect.
      c. Anginal syndrome, suspect.
      d. CHD, suspect, based on certain abnormal electrocardiographic or X-ray findings—isolated auricular fibrillation, isolated right bundle branch system block, isolated first degree A-V block, isolated suspect left heart strain (hypertrophy), nonspecific ST-T changes, isolated cardiomegaly on X-ray.

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*Based on references 8-10 as shown at end of text.

[1]Specifically, isolated left bundle branch system block or isolated LHS-LVH.

[2]Categories B4-B7 are grouped in the text as other heart disease, definite.

2. Hypertensive heart disease, suspect:
   This category includes those cases of definite or borderline diastolic hypertension exhibiting one or more of the following: suspect left heart strain on the electrocardiogram, borderline cardiomegaly on the X-ray, a suspicion of congestive heart failure.
3. Rheumatic heart disease, suspect.
4. Other heart disease, suspect:
   a. Syphilitic heart disease, suspect
   b. Congenital heart disease, suspect
   c. Cor pulmonale, suspect
   d. Heart disease, suspect, miscellaneous types.

D. Cerebrovascular disease:
   This is based on a bonafide history of a cerebral hemorrhage, embolism, or thrombosis, with demonstrable residual physical findings.

E. Peripheral vascular disease:
   This is based on a definite history of intermittent claudication with or without trophic changes and diminution in peripheral pulsations; also the finding of definite trophic changes of the extremities not attributable to any other disease entity, and associated with diminution in peripheral pulsations.

APPENDIX III

The Role of Different Parts of the Examination in Accounting for Diagnostic Disagreement

CLINICAL AND SPECIAL EXAMINATIONS

History of angina pectoris-chest pain			Other medical history[1]			Physical examination[2]		
Case number	Clinical	Special	Case number	Clinical	Special	Case number	Clinical	Special
A059	N	CHD-S	B035*	N	RHD-S	B035*	N	RHD-S
A073	N	CHD-S	A050	CHD	AS	B082*	N	OHD-S
			A052	CHD-S	CHD-S+ Ch.Myo-S			
A089	N	CHD-S	A078*	N	RHD	A007	N	RHD
B003	N	CHD-S	A099*	CHD-S	HHD-S	A067	N	AI
						A049	CHD+HHD	CHD+HHD+ RHD
B006	N	CHD-S	A061*	Cong.HD-S	RHD	A064	CHD+RHD	CHD+HHD
B032	N	CHD-S	J106*	CHD+HHD	N	J145	RHD-S	N
B119	N	CHD-S				A061*	Cong. HD-S	RHD
B051	N	CHD				J172	AS-S	N
A002*	N	CHD+HHD				A086*	Cong. HD-S	N
J178	CHD	AS						
B090*	CHD	N						
B004	CHD+HHD	HHD						
A029	RHD	CHD+RHD						
B068*	HHD+CHD	HHD				A078	N	RHD
A085	RHD	CHD+RHD						
A044	CHD-S	CHD						
J106*	CHD+HHD	N						
A057	CHD-S	CHD						
B014	CHD-S	CHD						
B034*	CHD-S	CHD						
B102	CHD-S	N						
B016	HHD-S	CHD+HHD						
B045	Cor pul.	CHD						

See footnotes at end of table.

CLINICAL AND SPECIAL EXAMINATIONS--Continued

Blood pressure			ECG[3]			X-ray		
Case number	Clinical	Special	Case number	Clinical	Special	Case number	Clinical	Special
A035*	N	HHD	B097	N	OHD-S	A035*	N	HHD
A013	CHD	CHD+HHD	B111	N	OHD-S	B082*	N	OHD-S
A023	CHD-S	HHD-S	J132	CHD	CHD-S	B073	OHD-S	N
A099*	CHD-S	HHD-S	A021	CHD	N	J173*	CHD-S	N
A002*	N	CHD+HHD	J152	HHD	HHD-S	A047*	HHD-S	N
			B085	HHD	N			
J-121*	CHD+HHD	CHD-S	B033	CHD+HHD	HHD			
			J174	CHD+HHD	HHD			
			J143	CHD+HHD	HHD			
			B090*	CHD	N			
			J129	CHD+HHD	HHD			
			J116	CHD+HHD	HHD			
			B068*	HHD+CHD	HHD			
			J121*	CHD+HHD	CHD-S			
			J103	CHD+HHD	CHD-S+			
					HHD-S			
			A004	CHD-S	N			
			A017	CHD-S	N			
			A027	CHD-S	N			
			A043	CHD+HHD	HHD			
			J170	HHD	N			
			B034*	CHD-S	CHD			
			A030	CHD-S	N			
			J109	CHD-S	N			
			J140	CHD-S	N			
			J158	CHD-S	N			
			J173*	CHD-S	N			
			A047*	HHD-S	N			
			A009	CHD-S+				
				HHD-S	N			
			A011	CHD-S+				
				HHD-S	N			
			A041	HHD-S+				
				RHD-S	N			
			A086*	Cong.				
				HHD-S	N			
			J131	Cor				
				Pul-S	N			

NOTE: In the following cases, it was not possible to delineate one or two areas of the examination as the major source of disagreement: A075, J112, B074, J127, B080, B077, J104, J108, J125, A042, A058, A079, J157, B117, A084, A083, J161, B055, A036.

See other footnotes at end of table.

History of angina pectoris-chest pain			Other medical history[1]			Physical examination[2]		
Case number	Special # 1	Special # 2	Case number	Special # 1	Special # 2	Case number	Special # 1	Special # 2
B063	N	CHD-S	B035*	RHD-S	N	B074	AS	CHD-S
B045	CHD	CHD-S				B035*	RHD-S	N
B051	CHD	N				J112	CHD-S+ AS-S	CHD-S
B058	HHD+ CHD	HHD						
B016	CHD+ HHD	HHD-S						
B006	CHD-S	N						
B032	CHD-S	N						

Blood pressure			ECG[4]			X-ray[4]		
Case number	Special # 1	Special # 2	Case number	Special # 1	Special # 2	Case number	Special # 1	Special # 2
J104*	N	HHD-S	B044	N	HHD-S	B080	CHD-S	N
B068*	HHD	CHD-S	J104*	N	HHD-S			
			B068*	HHD	CHD-S			

[1]e.g. dyspnea, myocardial infarction, myocarditis, rheumatic fever, hypertension.

[2]In all these cases, findings with respect to murmurs were the decisive factors accounting for diagnostic disagreements.

[3]In a few cases, disagreement resulted from data of earlier ECG's available to the full examination, rather than from different interpretations of the same recent ECG.

[4]The examining physicians in both examinations had access to the same ECG and X-ray interpretations, therefore diagnostic disagreements decisively attributable to these parts of the examination represent the examining and/or reviewing physicians' evaluations of the readings and data available to them.

*Two major sources of disagreement.

NOTE: In the following cases, it was not possible to delineate one or two areas of the examination as the major source of disagreement: B057, B082, F111, J125.

ABBREVIATIONS: CHD-coronary heart disease; HHD-hypertensive heart disease; RHD-rheumatic heart disease; Cong. HD-congenital heart disease; Cor pul.-Cor pulmonale; AI-Aortic insufficiency; AS-Aortic stenosis; Ch. Myo-chronic myocarditis; OHD- organic heart disease-etiology indeterminate. If the diagnosis is followed by -S, it is suspect; otherwise it is definite. N is no heart disease.

APPENDIX IV

Review of Cases Positive-Negative for CHD in Comparison of Clinical and Special Examinations

Case number	Age	Sex	Examination Date		Diagnosis		Blood Pressure		Hypertension		Limitation of Special Examination
			Clinical	Special	Clinical	Special	Clinical	Special	Clinical	Special	
A021	68	Male	7/24/57	11/6/57	CHD	N	160/80	120/78	-	-	No
	The two examinations differed in ECG interpretation, i.e., within normal limits by Special, CHD by Clinical Examination. Re-review of ECG by 4 M.D.'s failed to account for latter diagnosis. (Internist for the Clinical Examination reviewed entire case, at our request. Re-interpreted ECG as borderline curve, possible focal block. Patient's cardiovascular diagnosis as of 9/58 was: aortic atherosclerosis.)										
A043	70	Male	9/19/57	11/27/57	CHD+HHD	HHD	145/85	166/94	+	+	No
	Both examinations agreed on a diagnosis of HHD, with a history of antihypertensive therapy. The Clinical Examination diagnosed coronary plus hypertensive heart disease on the basis of the ECG. The Clinical Examination interpreted the tracing as left heart strain and coronary heart disease; the Special Examination read the ECG as left heart strain and first degree AV block, possible coronary artery disease.										
A050	53	Male	1/24/58	12/4/57	CHD	Aortic stenosis	130/75	130/90	-	-	No
	There was agreement between the Special and Clinical Examinations on the finding of a harsh systolic apical and aortic murmur, plus left bundle branch block on the ECG. The Special Examination made a diagnosis of ASHD with aortic stenosis, checking CHD as negative. From discussion, it is apparent that the examiners in the Special Examination had in mind atherosclerosis-arteriosclerosis of the aortic valve, as distinguished from coronary artery sclerosis. The Clinical Examination done one month after the Special, elicited an interval history (January 1958) of an episode suggestive of myocardial infarction. The totality of the data, including that episode, was therefore interpreted as coronary heart disease.										
B004	64	Female	11/25/57	12/10/57	CHD+HHD	HHD	190/100	190/100	+	+	No
	The Clinical Examination elicited a history of angina pectoris and therefore made the diagnosis of coronary plus hypertensive heart disease. In contrast, the Special Examination did not elicit an angina history and therefore diagnosed hypertensive heart disease only.										
B033	49	Female	2/14/58	1/17/58	CHD+HHD	HHD	170/110	164/100	+	+	No
	Findings were similar in the two examinations, including history of hypertension, X-ray findings, LHS on ECG. The diagnostic disagreement essentially relates to criteria for CHD in presence of HHD. The replicate Special Examination agreed on HHD diagnosis.										
B068	76	Male	5/1/58	2/14/58	HHD+CHD	HHD	180/100	160/100	+	+	No
	The Special and Clinical Examinations agreed in diagnosing HHD. The Clinical Examination had a history of angina pectoris, the Special did not. The Clinical Examination noted residua of anterolateral myocardial infarction on ECG, as well as left heart strain; the Special ECG originally was read as left heart strain, and then apparently reviewed and changed to questionable infarct pattern. Based on this early reading, plus the absence of an angina pectoris history, the Special Examination diagnosed HHD only, the full examination HHD+CHD. The first Special Examination was on 2/14/58 with blood pressures in the range 160-200 systolic and 100-110 diastolic. The second examination was 2/25/58, 11 days later, and blood pressures were in the range 156-168 systolic, 90-94 diastolic. Both agreed on previous antihypertensive therapy several years ago and none at present. Neither Special Examination elicited a history of angina. The two examinations dealt differently with the ECG, the first diagnosed left heart strain, the second suspect old infarct pattern. Based on these differences in ECG and blood pressure findings, there is a difference in diagnosis, the second Special Examination diagnosing CHD-S. This difference also reflects the limitations of a single visit examination, particularly in the blood pressure findings.										

Case number	Age	Sex	Examination Date		Diagnosis		Blood Pressure		Hypertension		Limitation of Special Examination
			Clinical	Special	Clinical	Special	Clinical	Special	Clinical	Special	
B090	65	Female	2/12/58	2/25/58	CHD	N	160/90	140/80	-	-	Yes

The Special Examination diagnosed no heart disease, blood pressure being consistently normotensive, the ECG being normal, the only positive findings being chest pain, interpreted as nonanginal, and a grade 2 systolic murmur at the apex, interpreted as nonsignificant. The Clinical Examination diagnosed definite CHD based on history and ECG, particularly the interpretation of definite angina pectoris (in contrast to the Special Examination interpretation) and a record of a previous ECG showing ST depression in leads 2 and 3, with return to a normal tracing on subsequent occasions. The diagnostic difference here relates to the difference in interpretation of chest pain, the availability of serial ECG's to the Clinical Examination in contrast to the Special, reflecting that particular limitation of the Special Examination.

J104	69	Male	10/4/57	11/25/57	CHD+HHD	N	210/90	172/74	+	-	No

The Clinical Examination— with blood pressures in June, September, and October 1957 in the range systolic 156-210 and diastolic 86-90; a history of angina pectoris (atypical); dyspnea of cardiac origin; congestive failure at present; hypertensive retinopathy; X-ray evidence of cardiomegaly, aortic calcification, and aortic elongation; ECG checked positive for CHD, for probable left heart strain and for nonspecific changes (flattened T)—diagnosed CHD plus HHD. The Special Examination was essentially negative in its findings, with normotensive blood pressure. The only positive findings in the Special Examination were nonspecific T-wave flattening on ECG and aortic elongation and calcification without heart findings on X-ray. The Special Examination had noted chest pain, which it regarded as nonanginal. The difference here is essentially physician difference in findings elicited and their interpretation. The second Special Examination diagnosed HHD-S.

J106	58	Male	12/2/57	3/3/58	CHD+HHD	N	184/100 (before RX) 130/74 (on RX)	190/94	+	+	No

There is agreement on hypertension and a history of antihypertensive therapy. The Clinical Examination diagnosed coronary plus hypertensive heart disease, the Special Examination, no heart disease. The Clinical Examination elicited a history of angina pectoris and exertional dyspnea presumably of cardiac origin. The Special Examination did not elicit these findings. The disagreement therefore is one of a difference in findings.

J108	61	Male	12/5/57	2/5/58	CHD+HHD	N	158/100	142/84	+	-	Yes

The Clinical Examination had systolic pressures in the range 148-160, diastolic, 82-100, dyspnea of cardiac origin and present congestive failure, Grade 1 hypertensive retinopathy, aorta elongation, ECG interpreted as probable posterior wall insufficiency. On the basis of these findings the diagnosis of HHD+CHD was made. The Special Examination, done two months after the Clinical Examination, found only aortic elongation on X-ray, a negative ECG, normotensive blood pressure, no evidence of congestive heart failure, and on this basis diagnosed no organic heart disease. This difference is essentially one of findings, and may be related to the time interval between the two examinations, although this cannot be ascertained with any validity. The two Special Examinations done three days apart, agreed on a diagnosis of no organic heart disease, no hypertension.

J116	58	Male	11/25/57	12/9/57	CHD+HHD	HHD	228/130	170/100	+	+	No

The Clinical Examination diagnosed HHD and CHD, based on the ECG, read as showing evidence both of HHD and CHD. The Special Examination read the ECG as left heart strain and diagnosed only HHD. This difference is therefore related to the interpretation of the ECG.

J129	66	Male	12/10/57	12/26/57	CHD+HHD	HHD	180/110	210/100	+	+	No

Clinical Examination interpreted ECG as giving evidence of both LHS and CHD in this hypertensive patient with X-ray evidence of aortic elongation and left ventricular enlargement. The Special Examination diagnosed only LHS on ECG, hence the diagnostic difference.

J143	54	Female	1/29/58	1/30/58	CHD+HHD	HHD	140/84	196/104	+	+	No

The Clinical Examination diagnosed CHD and HHD, although the available blood pressures are in the normotensive range. A history was elicited of a definite diagnosis of hypertension three years ago and a year ago, the ECG was read as left heart strain with ischemic changes and X-ray evidence was found of cardiomegaly with chamber enlargement. The Special Examination diagnosed only HHD, based on hypertensive pressures, plus the history of hypertension, plus the X-ray, plus the ECG interpreted only as heart strain. The difference here is essentially based on the ECG interpretation.

Case number	Age	Sex	Examination Date		Diagnosis		Blood Pressure		Hypertension		Limitation of Special Examination
			Clinical	Special	Clinical	Special	Clinical	Special	Clinical	Special	
J174	64	Female	11/13/57	2/27/58	CHD+HHD	HHD	160/90	144/78	+	+	No
	The Clinical Examination diagnosed CHD and HHD based on the physical examination and the ECG, the latter being read as evidencing CHD. The Special diagnosed HHD only, based on cardiomegaly and left ventricular enlargement on X-ray, plus a history of antihypertensive treatment, with the ECG read as showing nonspecific changes. This is essentially a difference based either on interpretation of the ECG or on availability of different ECG's.										
J178	68	Male	12/2/57	2/27/58	CHD	Aortic stenosis	150/86	154/86	-	+	No
	Both examinations agreed in finding systolic murmurs in both the mitral and aortic areas, and in finding auricular fibrillation. The Special Examination elicited a history of hypertension, with treatment during the last six months. Systolic pressures were in the range 140-170 and diastolic, 86-88, at the time of the Special Examination. The Clinical Examination mentioned no history of hypertension, no treatment for hypertension, and did not diagnose either hypertension or HHD; the Special Examination diagnosed hypertension. The Special Examination also noted ST depression in leads V3-5 on ECG. The Clinical Examination—unlike the Special—diagnosed AP. The Special Examination on final review diagnosed aortic stenosis, with the reviewing physician overruling a diagnosis by the examining physician of hypertensive and arteriosclerotic HD. Apparently this diagnosis of aortic stenosis is based primarily on the aortic systolic murmur. However, it is not at all clear why, with auricular fibrillation and S-T depression in the left chest leads, together with a history of hypertension, that the diagnosis of HHD was overruled.										
A002	60	Male	7/15/57	10/30/57	N	CHD+HHD	160/85	154/94	-	+	No
	Special Examination elicited a variety of significant findings not elicited by the Clinical - AP, a grade 2 aortic systolic murmur, BP elevation, hypertensive retinopathy. It is not clear whether the AP history is recent enough to have originated in the interval between the two examinations.										
A029	50	Male	2/24/58	11/13/57	RHD	CHD+RHD	130/75	150/80	-	-	No
	Both examinations diagnosed RHD. Both studies elicited a history of chest pain, interpreted as AP by Special Examination, as "other chest pain" by Clinical Examination.										
A085	47	Female	6/11/57	1/22/58	RHD	CHD+RHD	110/75	96/70	-	-	No
	There was complete agreement between the Special and Clinical Examinations on presence of organic heart disease, specifically rheumatic heart disease. The Special Examination, unlike the Clinical Examination, also diagnosed coronary heart disease based on eliciting a history of angina pectoris. A review of the history in the Special Examination in this case revealed that the episode of angina was in 1955 in connection with auricular fibrillation.										
B016	56	Female	11/7/57	12/13/57	HHD-S	CHD+HHD	170/110	194/100	+	+	No
	The Special Examination elicited a history of chest pain, interpreted as AP, whereas the Clinical Examination did not. This is the essential difference between the two examinations, leading to diagnostic disagreement. The repeat Special Examination, inadvertently done by the same examiner as the first Special Examination, diagnosed HHD-S.										
B045	64	Male	1/21/58	2/4/58	OHD-S (etiology indeterminate)	CHD	146/90	140/82	-	-	No
	The Clinical Examination interpreted "precordial recurrent pain on exertion with normal ECG" as nonanginal, and made a diagnosis of suspect organic heart disease, etiology indeterminate, based on X-ray finding of left ventricular enlargement. The Special Examination made diagnosis of definite CHD based essentially on a history of chest pain interpreted as definite angina pectoris, plus an aortic systolic murmur and the X-ray findings. The second Special Examination diagnosed CHD-S.										
B051	74	Female	12/27/58	1/31/58	N	CHD	160/80	176/80	-	-	No
	The Clinical Examination was negative for CHD, whereas the Special Examination elicited chest pain interpreted as AP, plus other findings supporting a diagnosis of CHD. The replicate Special Examination agreed with Clinical Examination, i.e., both are negative.										

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